

CATC FCTracer and FCTracer 4GTM Fibre Channel Protocol Analyzer

User's Manual

Manual Version 2.10



For FCTracer Software Version 2.10

20 September, 2004

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Release Information

This is version 2.10 of the *CATC FCTracer and FCTracer 4G™ Fibre Channel Protocol Analyzer User's Manual*. This manual is based on FCTracer software version 2.10.

EU Conformance Statement

This equipment complies with the EMC Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC, and their associated amendments for Class A Information Technology Equipment. It has been tested and found to comply with EN55022 and EN55024 (EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-11, EN61000-3-2, EN61000-3-3), and EN605950.

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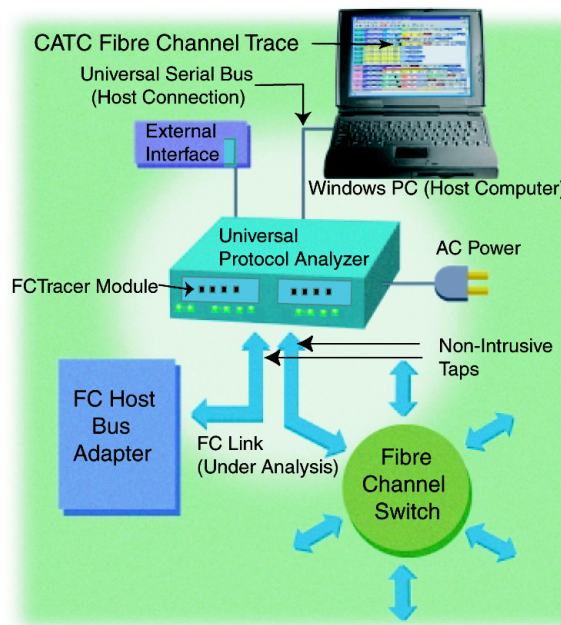
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1. Overview

1.1 FCTracer 4G and FCTracer Fibre Channel Protocol Analyzers

CATC's *FCTracer*TM 4G and *FCTracer* are portable Fibre Channel test and debug platforms that combines non-intrusive, multi-port recording with the most advanced triggering and decoding features available. By leveraging years of experience in protocol analysis tools for emerging markets, *FCTracer* 4G and *FCTracer* blend sophisticated functionality with practical features to allow designers and validation engineers to easily specify multi-level, conditional trigger scenarios to pinpoint intermittent problems in the Fibre Channel fabric.



System level validation requires non-intrusive monitoring from multiple probe points within the SAN. *FCTracer* 4G and *FCTracer* ensure accurate data collection by providing transparent taps using active port bypass circuits capable of recording 1, 2 and, in the case of *FCTracer* 4G, 4 Gbps Fibre Channel traffic at full line rate. At the heart of *FCTracer* 4G and *FCTracer* is the CATC BusEngineTM protocol processor that incorporates both a real-time recording engine and configurable tools to trigger and filter high-speed Fibre Channel traffic.

Effective analysis requires isolating important traffic. Both *FCTracer* 4G and *FCTracer* have powerful triggering capabilities that include two independent sequencers that can track two unrelated series of events in

parallel. The presence of two independent sequencers is like having two analyzers in one - each sequencer can separately monitor up to 256 levels of trigger logic with up to six "events" per level. *FCTracer 4G* and *FCTracer* dynamically allocates memory resources up to a maximum of 2 GB across all four recorded channels. Users can selectively exclude any channel from the recording to boost memory depth for the remaining channels.

System level debug frequently requires tools to capture intermittent problems. *FCTracer 4G* and *FCTracer* have a Long Term (Spooled) Recording mode; enabling capture of data for days to better analyze problems. *FCTracer 4G* and *FCTracer* also supports remote operation over a LAN and unattended control of the analyzer with an Automation API.

FCTracer 4G and *FCTracer* include a Traffic Summary utility that provides statistics on the occurrence of errors, primitives, frames, sequences, and exchanges. Users can evaluate these metrics at a glance or use them to navigate through the trace.

FCTracer 4G also features graphical bus utilization and throughput reports that provide a histogram of activity dynamically linked to frame level details. Real-time monitoring continuously displays metrics for each port providing a high level view of network performance. Ideal for system-level test and debug, *FCTracer 4G* tracks throughput and recovered errors for end-to-end Fibre Channel analysis.

For complete product information, please visit www.catc.com.

The Fibre Channel specification is available from the Fibre Channel TA at its web site <http://www.fibrechannel.org/>

FEATURES	BENEFITS
2 Parallel Event Sequencers with 256 States, each with Independent Trigger & Filter Criteria	Isolate intermittent problems by tracking two completely independent event sequences in parallel
FCTracer 4G: 1, 2 & 4 Gbps FC Ports FCTracer: 1 or 2 Gbps ports	Monitor, trigger and record multiple Fibre Channel ports simultaneously
Link Tracker™ Trace Display	Chronologically display all DWORDs on all channels synchronized to a common clock
Frame Tracker™	Chronologically displays all FRAMES on all channels synchronized to a common clock

Hardware Filtering	Extend capture window by removing non-essential primitives or truncating data payloads from the trace
Performance Statistics	Quickly identify and track error rates, abnormal bus or timing conditions
Long Term (Spooled) Recording	Enable capture of intermittent problems for which trigger conditions are difficult to predict
Verification Script Engine	Allows users to create programs to perform customized analysis on captured traces
Cascade Multiple Analyzers	By cascading up to 4 analyzers, time correlated traces for up to 16 channels can be obtained
Remote Access over LAN	One or more FCTracers can be controlled over the network
Traffic Summary Reports	Statistical summaries provide high level view of events, sequences, exchanges, errors & throughput
Collapsible / Expandable Headers	Increased drill-down on Exchanges, Sequences, or individual Frames
Real-time Performance Monitoring & Statistics	Easily identify throughput problems and anomalies
Dynamically Allocated Memory Pool	(2 GB) captures long time-windows for analysis and problem solving

1.2 The CATC Trace

While other products display the stream of frames in difficult-to-understand text format, the CATC Trace expert software system matches a strong decoding engine with an easy to use graphical user interface that removes complexity and aids the user to understand information quickly. The CATC Trace displays each Primitive, Data Frame, or decoded Sequence on a separate row and logically groups all sequences that are part of a common exchange. FC-2 and FC-4 level events are decoded and any protocol errors are automatically marked in red. This view groups and displays SCSI operations (FCP mapping) with easy "drill down" to sequence and frame level detail. Context sensitive ToolTips help explain the specification and provide ease-of-use and understanding for Fibre Channel development teams.

The additional Link Tracker display allows users to see DWORD level bus traffic in a table view. This simplifies analysis of state transitions by displaying the Fibre Channel traffic, moving across all channels, synchronized to a common reference clock. Link Tracker may be used independently or time synchronized with the CATC Trace display.

FCTracer's combination of the CATC Trace display, which logically arranges bus traffic, and Link Tracker, which provides a chronological representation, is a unique and powerful tool.

For additional information on the CATC Trace, please download the White Paper from the CATC website:

<http://www.catc.com/support/whitepapers/index.html>.

1.3 Automation

The FCTracer software includes an Application Program Interface (API) that will allow you to develop test programs and scripts in C++ and Visual Basic. The API reproduces most of the commands embodied in the FCTracer trace viewer software. This API allows users to automate procedures that otherwise have to be run manually via the trace viewer software. The Automation API can be run locally on the PC attached to FCTracer or remotely over a network connection.

For further details, refer to the ***Automation API for CATC FCTracer Reference Manual*** included in the installation CD-ROM. You can also download the document from the CATC website.

1.4 File-Based Decoding

The *FCTracer* application lets users create their own custom decodes. Users can customize the decoding for three types of FC Sequences:

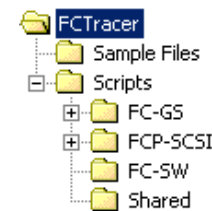
- FCP SCSI Sequences
- FC Generic Services (FC-GS) Sequences
- FC Switched Services (FC-SW) Sequences.

FCTracer uses special text-based decoder files (**.dec**) to decode the payloads of these Sequences. The decoder files are initialized when the *FCTracer* application is started. When a trace is displayed onscreen, the *FCTracer* application decodes and displays the payload fields as instructed by the decoder files.

To create a custom decode, all you have to do is modify one or more of these decoder files. You can also create new decoder files.

Decoder files are located under the /scripts directory. There are three sub-directories there - one for each type of Sequence:

- /FC-GS
- /FCP-SCSI
- /FC-SW



Opening these sub-directories will reveal one decoder file (.dec) per sub-directory and several .inc files.

Because the decoding schemas for supported protocols are fairly complex, CATC provides a decoding "framework" to simplify the task of writing vendor-specific custom decoders. This "framework" consists of special sets of tables and functions implemented in the provided files.

The simplest way to edit a decoder file or to create new one is to follow the framework format in the decoder files.

Decoder files are written in the CATC Scripting Language (CSL), a language based on C language syntax that is easily learned by anyone with a C programming background.

For further information on file-based decoding, refer to the ***CATC Scripting Language Reference Manual for FCTracer*** included in the installation CD-ROM. You can also download the document from the CATC website.

CATC also provides a library of script constant, variables and script API functions which enhance the capabilities of CSL and make the job of writing decoding scripts even easier.

For further information on CATC script API, refer to the file:
"CATCScriptAPI.inc" in \script\shared directory.

1.5 Specifications

The following specifications describe a combined FCTracer and Universal Protocol Analyzer System.

Package

Dimensions:	UPAS 10,000: 12.2 x 3.5 inches (31.1 x 31.1 x 8.9 cm) FCTracer 4G Plug-in: 9.3 x 6.7 x 1.3 inches (23.6 x 17.0 x 3.2 cm) FCTracer Plug-in: 4.5 x 6.7 x 1.3 inches (11.3 x 17.0 x 3.2 cm)
Connectors:	UPAS AC power connection External trigger connection (DB-25, BNC) PC connection (USB2.0, type "B") Break-out board (type "D") Recording Channel
Weight:	UPAS 10K: 9.5 lbs (4.3 kg) FCTracer 4G Plug-in: 1.8 lbs (.82 kg) FCTracer Plug-in: 1 lb 11.4 oz (0.77 kg)

Power Requirements

90-254 VAC, 47-63 Hz, 165W maximum (universal input)

Environmental Conditions

Operating Range:	0 to 40 °C (32 to 104 °F)
Storage Range:	-20 to 80 °C (-4 to 176 °F)
Humidity:	10 to 90%, non-condensing

Switches

Power:	On/off
Manual Trigger:	When pressed forces a trigger event

Indicators (LEDs)

UPAS:	Power (PWR): Illuminated when analyzer is powered on
Status (STATUS):	Illuminated during Power-On Self Test (POST)

Recording (REC):	Illuminated when the analyzer is actively recording traffic data
Triggered (TRG):	Illuminated when the analyzer has a trigger condition
Uploading (UPLD):	Illuminated when the analyzer is uploading its recording memory to the Host PC for displaying the CATC trace and during the memory-testing step of the POST
FCTracer Plug-in:	Link activity status

Probing Characteristics

FCTracer 4G	4 Gbps SFP for 4 Gbps traffic
Connection:	Stacked SFP modules may be used for 2 Gbps or 1 Gbps traffic Interchangeable with multimode or single mode optical fibre or copper components
FCTracer	Standard SFP Modules
Connection:	Interchangeable with multimode or single mode optical fibre or copper components

Recording Memory Size

2 GBytes for trace capture, timing, and control information.

Basic Trigger Events

Conditions:	Primitives, Data Frames, Disconnect or Connect of the Link, Frame Header, SOF Primitive, EOF Primitive, Basic Link Services, SCSI Operations
Errors:	Invalid 10b codes, CRC Errors, Running Disparity Errors, EOF Abort, K28.5 Comma Alignment Errors, Missing IDLE Primitives

2. Installation

FCTracer 4G and FCTracer are factory-installed hardware modules that are sold as part of the Universal Protocol Analyzer System 10000 (UPAS 10000).

The UPAS 10000, the FCTracer module, and associated software are easily installed. You can begin making Fibre Channel recordings after following the steps shown below.

Note Henceforth, both FCTracer 4G and FCTracer will be referred to as FCTracer.

2.1 System Components/Packing List

- Factory-installed FCTracer Analyzer module(s)
- One USB cable
- FCTracer software program CD-ROM
- Breakout Board
- DB-25 Cable
- User Manual
- BNC Cable

2.2 Fibre Channel Cabling Requirements

You will need to provide fibre channel cables and SFPs.

2.3 Host PC Requirements

FCTracer connects to a Host PC over a USB line that supports USB 2.0. Please consult the readme file on the installation CD for the latest PC requirements.

2.4 FCTracer Modules

Users can order FCTracer in three configurations:

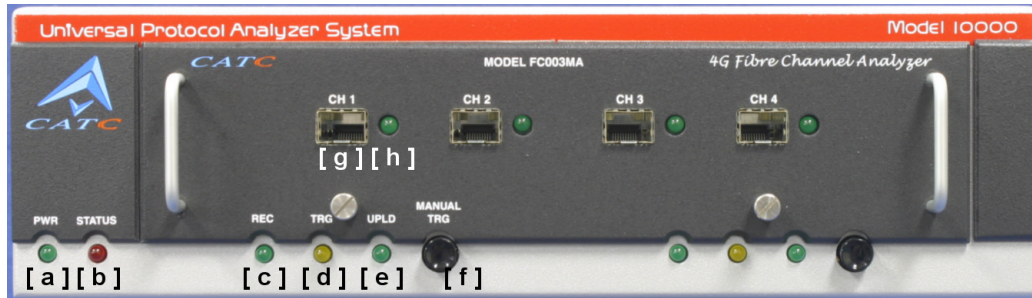
- Two channel (with FCTracer module installed in left-slot)
- Four channel (same as above but with additional channels enabled through software license)
- Eight channel (two four-channel FCTracer modules installed)

2.5 FCTracer 4G Analyzer LED Descriptions

When powered on, the FCTracer 4G activates the user-accessible controls and LEDs on the front and rear panels of the UPAS.

Warning Do not open the UPAS enclosure. There are no operator serviceable parts inside. Refer servicing to CATC.

Figure 1: FCTracer 4G Front Panel



Front Panel Description

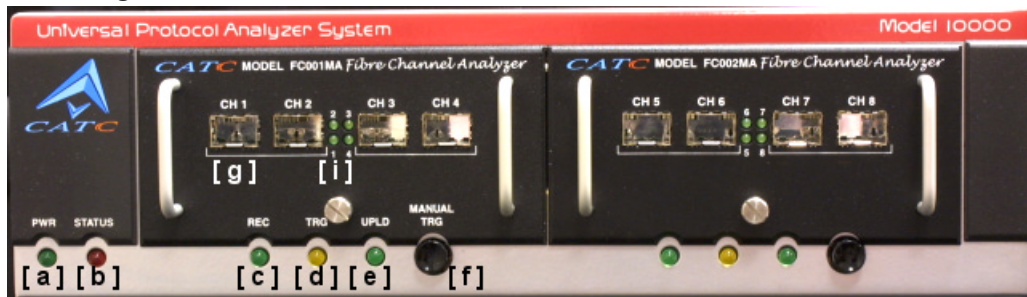
- A PWR** (power) - Green indicator LED for UPAS. Lights when the unit power is switched on.
- B Status** indicator - Red indicator LED for UPAS. Lights during initialization/power up of UPAS base unit. Blinks if a self-test fails.
- C REC** (recording) - Green LED. Lights when the unit is recording.
- D TRG** (triggered) - Orange LED. Lights when the unit triggers on an event.
- E UPLD** (Upload) - Green LED. Lights when trace is being uploaded from the analyzer to the PC.
- F Manual Trigger** - Push-button. Allows a manual Trace capture.
- G** Fibre Channel Connector
- H** Green Status LED. Illuminates when a physical connection is made between the DUT and the Channel.

2.6 FCTracer Analyzer LED Descriptions

When powered on, the FCTracer activates the user-accessible controls and LEDs on the front and rear panels of the UPAS.

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Figure 2: FCTracer Front Panel



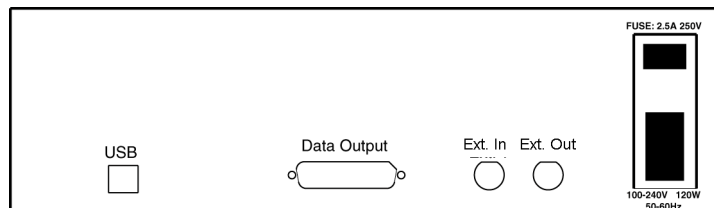
Front Panel Description

- A PWR** (power) - Green indicator LED for UPAS. Lights when the unit power is switched on.
- B Status** indicator - Red indicator LED for UPAS. Lights during initialization/power up of UPAS base unit. Blinks if a self-test fails.
- C REC** (recording) - Green LED. Lights when the unit is recording.
- D TRG** (triggered) - Orange LED. Lights when the unit triggers on an event.
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- F Manual Trigger** - Push-button. Allows a manual Trace capture.
- G** Fibre Channel Connector
- H** Green Status LED. Illuminates when a physical connection is made between the DUT and the Channel.

2.7 Rear Panel Description

From left to right, the UPAS rear panel contains the following components:

Figure 3: Rear Panel



USB type “B” host computer connector

This connector links the analyzer to the Host PC. for the purpose of transmitting commands from the PC to the analyzer and uploading traces from the analyzer's recording memory to the FCTracer software for viewing and analysis.

RS-232 25 pin "Data Output" Connector

This connector links a 25 pin RS-232 cable to an external breakout board. The breakout board allows signals to be sent from the analyzer to an external device such as an oscilloscope or from an external device to the analyzer for the purpose of triggering on an external input. You configure input/output signalling through the Recording Options dialog box. Breakout board use is described at the end of this chapter.

BNC Connectors "Ext. In" and "Ext. Out"

These connectors allow BNC cables to be attached to the analyzer for the purpose of triggering on external input signals or for sending an output signal from the analyzer to another device. These connectors have the same function as the 25 pin RS-232 connector - i.e., they channel input and output signals but do not support the use of a breakout board.

Wide range AC connector module

- Power socket
- Power on/off switch
- Enclosed 5x20 mm 2.0A 250 V fast acting glass fuse

Warning For continued protection against fire, replace fuse only with the type and rating specified above.

2.8 Setting Up the Analyzer

Step 1 Remove the FCTracer/UPAS from its shipping container.

The FCTracer module will already be installed in the left slot. If you have purchased an 8-channel FCTracer, both slots will have analyzer modules.

Step 2 Connect the Analyzer unit to a 100-volt to 240-volt, 50 Hz to 60 Hz, 120 W power outlet using the provided power cord.

Note The Analyzer is capable of supporting supply voltages between 100-volt and 240-volt, 50 Hz or 60 Hz, thus supporting all known supply voltages around the world.

Step 3 Turn on the power switch on the rear of the UPAS.

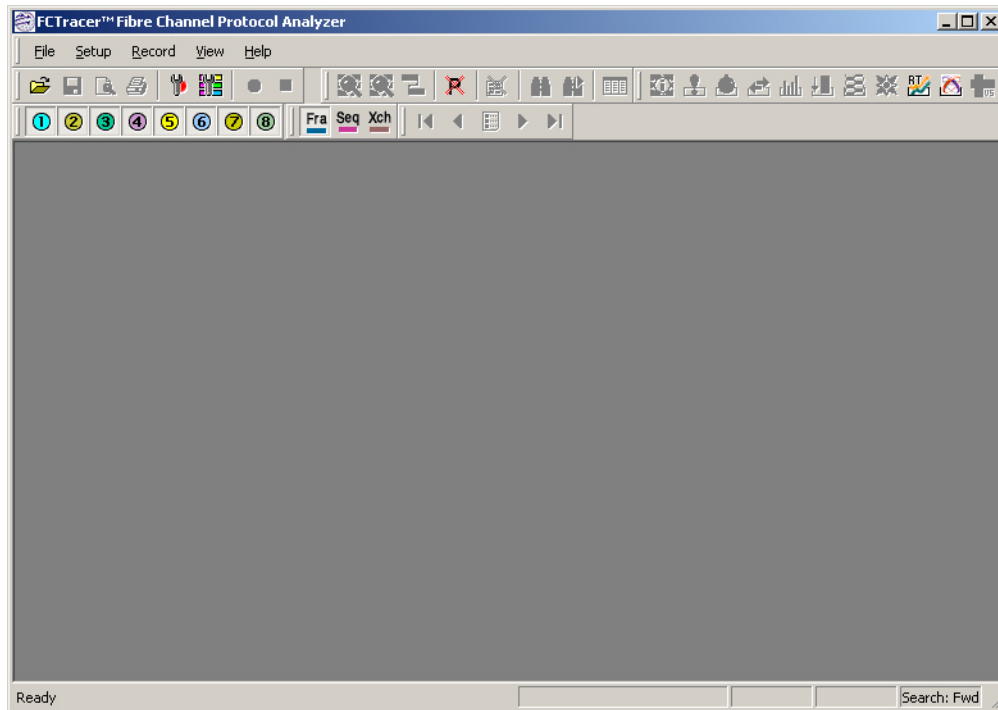
- Note** At power-on, the analyzer initializes itself in approximately ten seconds and performs an exhaustive self-diagnostic that lasts about five seconds. The Status LED of the UPAS base unit turns red on power up/initialization. The LED remains on approximately 25 seconds while the analyzer performs self-diagnostic testing. If the diagnostics fail, the Status LED will blink red, indicating a hardware failure. If this occurs, call CATC Customer Support for assistance.
- Step 4** Insert the CD into the CD ROM drive of the PC that will be controlling the analyzer.
- Step 5** Connect the USB cable between the USB port on the back of the analyzer and a USB port on the PC.
- The host operating system detects the analyzer and begins to install the USB driver.
- Step 6** Follow Windows on-screen Plug-and-Play instructions for the automatic installation of the analyzer as a USB device on the Host PC (the required USB files are included on the FCTracer CD). Step through the Windows hardware wizard. The wizard will automatically install FCTracer as a USB device on the PC. When the wizard prompts you for driver information, point it to the CD which should be in your disk drive and install **catcupa.sys** and **FCTracer.sys**.

2.9 Installing the Analyzer Software

Once FCTracer has been recognized as a USB device, install the FCTracer software on the Host PC.

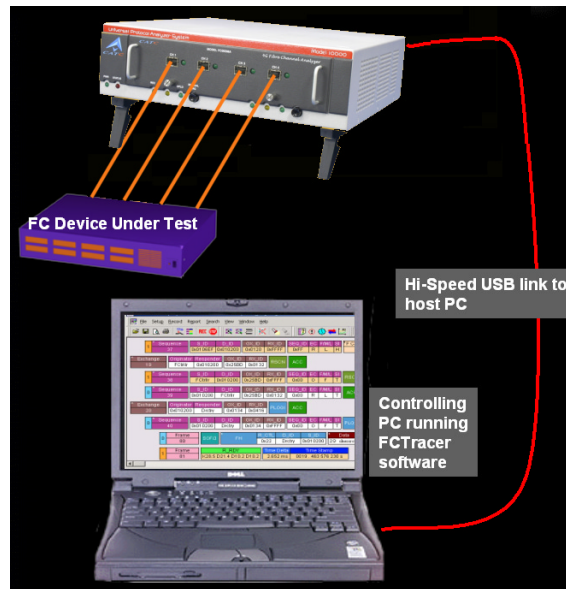
- Step 1** On the PC, run **Install Software** on the installation CD and follow the on-screen instructions.
- The FCTracer software will install on the PC hard disk.
- Step 2** To start the application, launch the CATC FCTracer program from the Start menu:
- Start > Programs > CATC > FCTracer.**

The FCTracer program opens.



Note The software may be used with or without the analyzer. When used without an analyzer attached to the computer, the program functions as a Trace Viewer to view, analyze, and print captured traffic.

2.10 Connecting the Analyzer to the Device Under Test

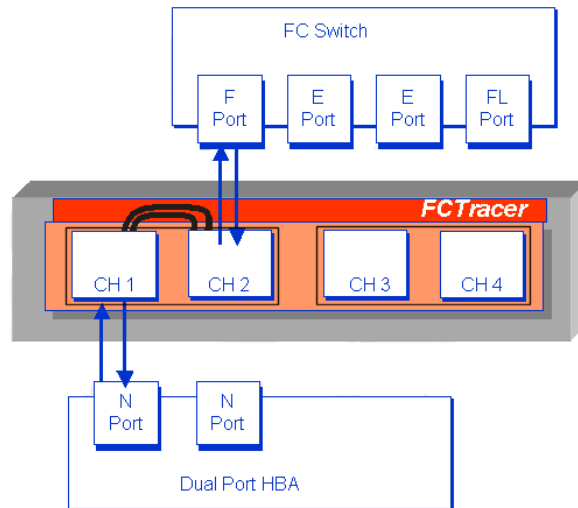


The analyzer can be connected and configured in two ways: as a repeater where traffic is routed into and out of the analyzer, and as a sniffer where the analyzer listens to a link without transmitting. When the analyzer is configured as a repeater, it echoes the FC signal. The analyzer does not, however, occupy a node on the FC fabric. In repeater mode, the analyzer does not re-time the signal but does add a very small amount of latency. When configured as a sniffer, the analyzer passively monitors the link without adding latency. This latter role is particularly useful if you are trying to monitor latencies between ports in a hub.

In the following section, you are shown how to connect the analyzer to two devices, for example, an HBA and a switch. In this set up, FCTracer will act as a repeater and will use two channels on the front panel for the connections.

Connecting the Analyzer

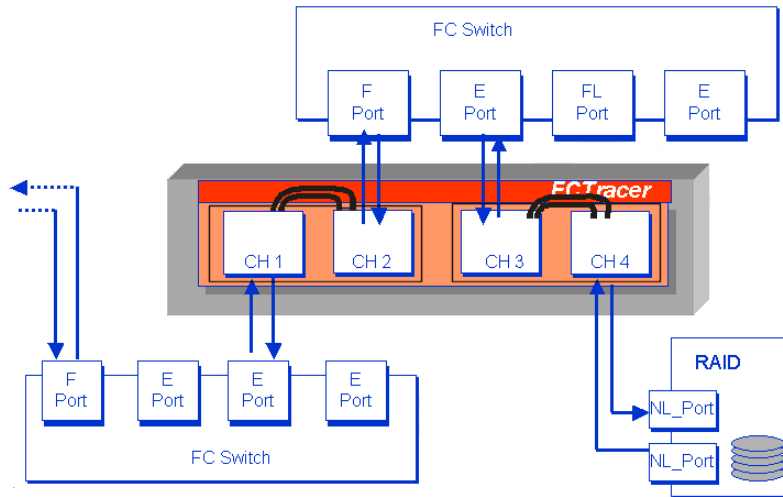
Connect two adjacent channels on the analyzer -- meaning Channels 1 and 2, or Channels 3 and 4 etc. -- to the two devices as shown in the diagram below. You must use adjacent pairs of channels on the analyzer because they are physically wired together. You can not, for example, use Channel 1 and Channel 3.



- Step 1** Connect a fibre channel cable between the first device under test (DUT) and a port on the analyzer, for example Channel 1.
- Step 2** Connect a second fibre channel cable between the second DUT and a second adjacent port *on the same module* on the analyzer, for example Channel 2. These two analyzer ports will act as a pair. Traffic will enter one port and exit the other.

Placing the Analyzer between Multiple Nodes

FCTracer can be connected to multiple devices as shown in the diagram below:

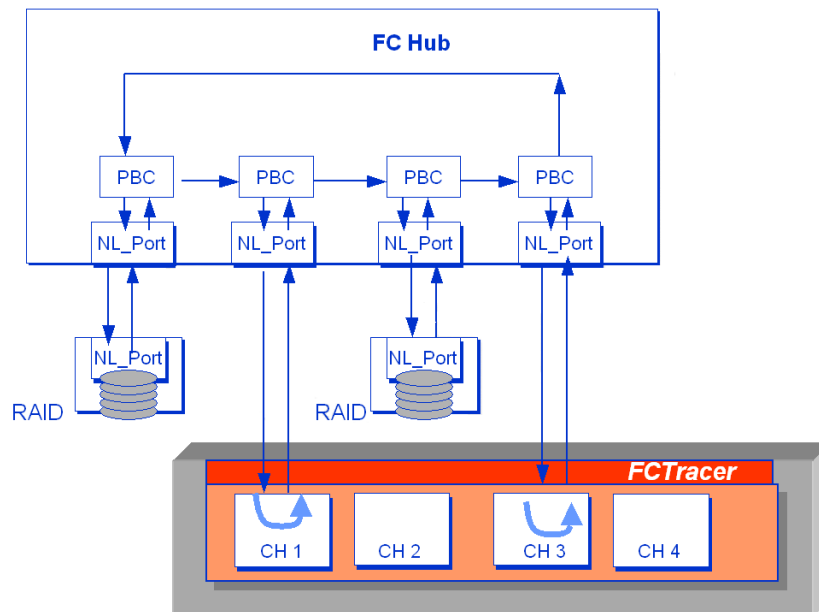


Follow the same cabling principle described above: use adjacent pairs of analyzer channels for these connections -- Channel 1 and 2, or Channels 3 and 4 etc. After connecting the analyzer to the devices, you are ready to configure the analyzer Recording Options and begin recording.

Connecting FCTracer to a Hub

FCTracer can be connected in two ways to a hub: as a repeater, and as a sniffer that receives traffic but does not transmit it. In both setups, you use only one cable to connect the analyzer to the hub.

Connecting FCTracer to a Hub as a Repeater ("Single Channel Loopback")

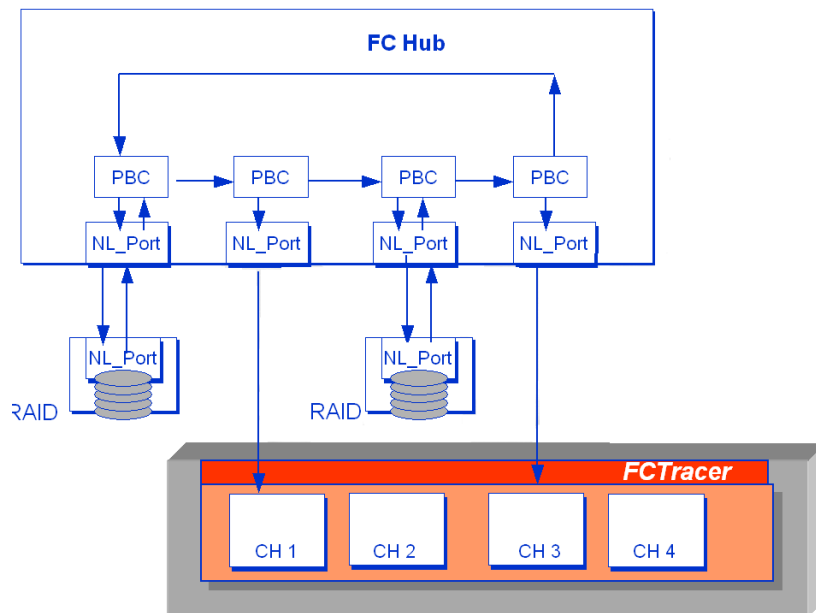


When connected to a hub, FCTracer can be configured to loop traffic through a single channel as shown above. (This example shows two channels so configured). This mode is referred to as *Per Channel Loopback*. In *Per Channel Loopback* FCTracer functions as a repeater - transmitting and receiving traffic to and from a hub on the same channel. You enable loopback via the Recording Options described later.

Connecting FCTracer to a Hub as a Sniffer ("Loopback Disabled")

A sniffer is a passive listening device that does not transmit traffic. When configuring FCTracer to function as a sniffer on a hub, you disable loopback signalling. In this configuration, the analyzer listens to traffic but does not transmit. The hub will sense the lack of transmission from the analyzer and will disable the hub port used by the analyzer. However, the

hub will continue to transmit on the disabled port, thereby allowing the analyzer to passively monitor the traffic. This mode allows you to monitor devices on a hub without the latency that might occur in loopback mode.



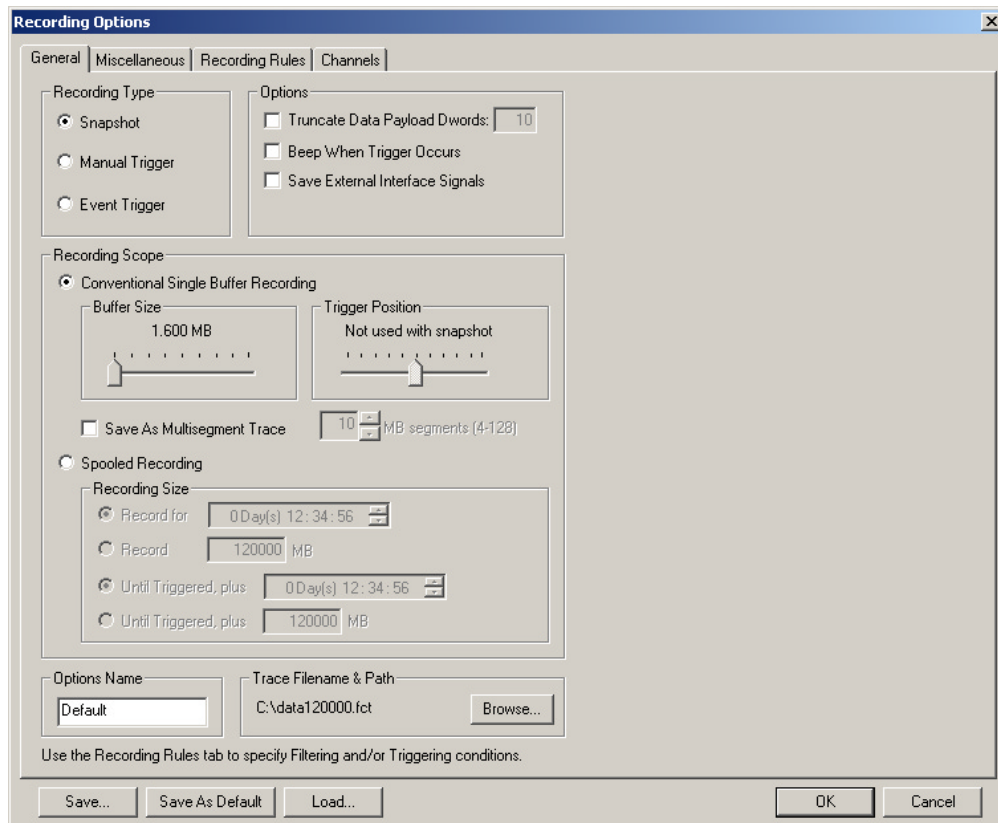
2.11 Making a Fibre Channel Recording

After connecting the analyzer to the device(s), you will need to configure the Recording Options. Then you can test the analyzer by creating a 16-Mbyte snapshot recording.

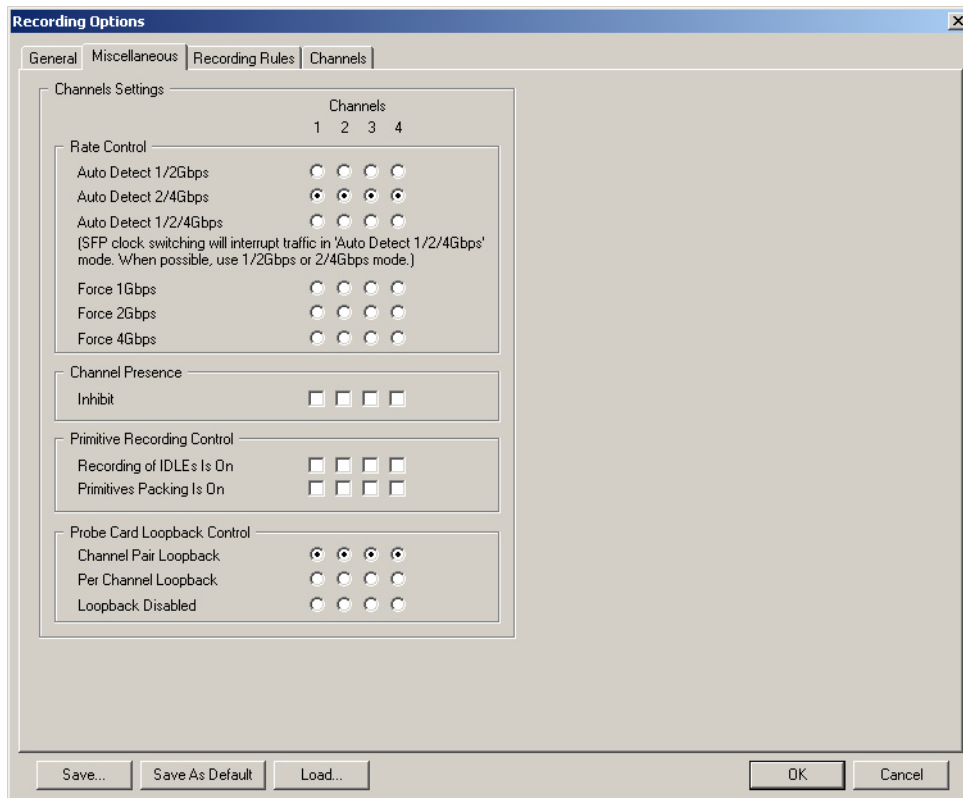
To make this recording, follow these steps:

- Step 1 From the **Setup** menu, select **Recording Options**.
- Step 2 Select the **General** tab.

The following window displays the factory default settings such as “Snapshot” and 16 Mbytes buffer size are displayed. For your first recording, you can leave these settings unchanged.



Step 3 Click the **Miscellaneous** tab. The following window displays:



Note The page shown above and in the following few screenshots is for **FCTracer 4G**. The **Miscellaneous** page for **FCTracer** shows eight channels.

- Step 4** For this recording, leave all settings as is except for those in the Probe Card Loopback Control section. You will need to set these in order to successfully record.
- Step 5** From the Loopback Control options, select the options appropriate for your setup. Your options are:

Channel Pair Loopback - Configures the analyzer as a repeater and causes traffic to be routed into one channel and out an adjacent one. When using **Channel Pair Loopback**, you must select two adjacent channels: Channel 1 and Channel 2, Channel 3 and 4, etc. Your selection must also match how your devices are physically attached to the analyzer. For example, if you connect an HBA to Channel 1 and a switch to Channel 2, be sure to select Channel 1 and 2 in the **Channel Pair Loopback** options.

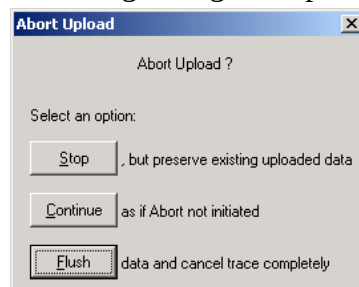
Per Channel Loopback - Configures the analyzer as a repeater and causes traffic to be routed into and out of a single analyzer channel. This option is used with hubs. Example: connect Channel 1 to a hub. Then select Channel 1 from the **Per Channel Loopback** options.

Loopback Disabled - Configures the analyzer as a sniffer. Causes the analyzer to passively listen to the selected channel without transmitting traffic. This option is used with hubs. Example: connect Channel 1 to a hub. Then select Channel 1 from the **Loopback Disabled** options.

- Step 6 Click **OK** to accept your Recording Options selections and close the dialog box. The analyzer is now ready for recording.
- Step 7 Click  on the Tool Bar. This is the Start button and will cause the analyzer to begin recording. After 16 Mbytes of traffic has been recorded, the analyzer uploads the data and displays the sequences.

Stopping a Recording

You can stop the recording process at any time by pressing . Afterwards, the following dialog box opens:



This dialog presents options for stopping, continuing, or aborting the recording:

- **Stop** - Stops the recording and then displays the trace on screen.
- **Continue** - Resumes the recording.
- **Flush** - Cancels the recording without saving or displaying the trace.

When the recording session is finished, the bus traffic is uploaded to the PC and is automatically saved to the hard drive as a file named **data.fct** or the name you assign as the default filename.

1	Frame 100385	1 G	SOFn3	FH	FCP_DATA	D_ID FCP-2	S_ID 0x0000EF 0x000001	Data 512 dwords	CRC 0x5F457A8E
2	Frame 100443	1 G	SOFi3	FH	FCP_RSP	D_ID FCP-2	S_ID 0x000001 0x0000EF	Data 6 dwords	CRC 0x7D98AB7D
1	Frame 100509	1 G	SOFi3	FH	FCP_CMND	D_ID FCP-2	S_ID 0x0000EF 0x000001	Data 8 dwords	CRC 0x745C7791
2	Frame 100564	1 G	SOFi3	FH	FCP_XFER_READY	D_ID FCP-2	S_ID 0x000001 0x0000EF	Data 3 dwords	CRC 0x2B2F93A7

Step 8 To save a current recording for future reference, select **Save As** from the **File** menu.

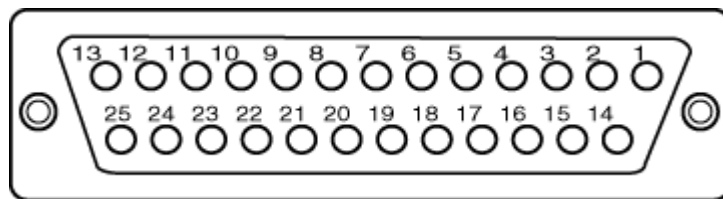
Step 9 Give the recording a unique name and save it to the appropriate directory.

2.12 External Interface Breakout Board

With each analyzer, CATC includes an *External Interface Breakout Board* for accessing several potentially useful standard, LV TTL output and input signals. The breakout board also offers a simple way to connect logic analyzers or other tools to the FCTracer Analyzer unit. Six ground pins and one 5-volt pin are provided.

The Breakout Board connects via a cable to the **Data In/Out** connector located on the rear of the analyzer unit. Each signaling pin is isolated by a 100Ω series resistor and a buffer inside the Analyzer unit.

Data In/Out Connector (on cable)



Pin-Outs for the Data In/Out Connector

The following table lists the pin-out and signal descriptions for the **Data In/Out** connector on a cable that connects to the breakout board.

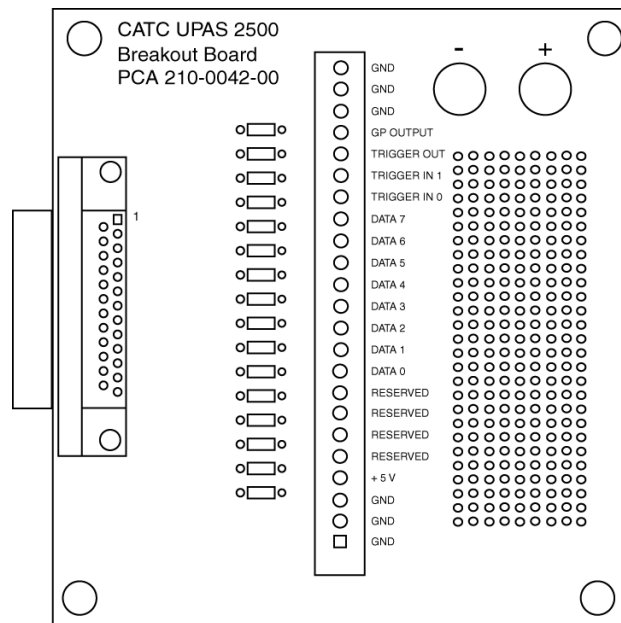
Data In/Out Connector – Pin-Out

Pin	Signal Name	Signal Description
1	RSV	Reserved
2	GND	Ground

Pin	Signal Name	Signal Description
3	GP OUT	General Purpose Output
4	TRG IN 1	Trigger In 1
5	GND	Ground
6	DATA 6	Data 6
7	DATA 4	Data 4
8	DATA 3	Data 3
9	DATA 1	Data 1
10	GND	Ground
11	RSV	Reserved
12	RSV	Reserved
13	+5V	+5 Volts, 250 mA DC Source
14	RSV	Reserved
15	GND	Ground
16	TRG OUT	Trigger Out
17	TRG IN 0	Trigger In 0
18	DATA 7	Data 7
19	DATA 5	Data 5
20	GND	Ground
21	DATA 2	Data 2
22	DATA 0	Data 0
23	GND	Ground
24	RSV	Reserved
25	RSV	Reserved

Note (*) Pins 4 and 17 have the same function: they allow external signals to be used to cause triggering or recording. Pins 3 and 16 are used to transmit output signals. Pins 6, 7, 8, 9, 18, 19, 21, and 22 (data pins) are used to define data patterns for external input signals. See External Input Signals in Chapter 6.

External Interface Breakout Board



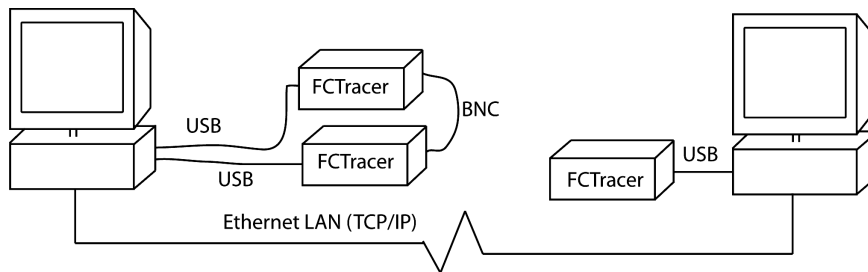
Prototype Rework Area

The Breakout Board contains a prototype rework area for making custom circuits for rapid development. The area consists of plated-through holes, 20 columns wide by 27 rows long. The top row of holes is connected to GND and the bottom row is connected to +5V. The remaining holes are not connected. Use the rework area to insert custom components and wire-wrap their respective signal, power, and ground pins.

Configuring the Analyzer for the Breakout Board

To configure the analyzer for the breakout board, see the chapter on Recording Options.

3. Networking FCTracer 4G



Both the FCTracer 4G and FCTracer have networking and cascading functions that are described in this chapter.

- **Cascading** -- Allows two to four analyzers be linked (or "cascaded") together into a single, synchronized, logical unit in order to increase the number of ports that can be monitored. To enable synchronized multi-analyzer recording, the analyzers are connected together via their BNC connectors on the back of the analyzers. This connection is used to send clocking information and recording commands are sent from one analyzer to another.
- **Networking** -- FCTracer can be run remotely over an IP LAN. Using the Network browse dialog, you can remotely control one or more analyzers.

Note Henceforth, both analyzer models will be referred to as FCTracer.

3.1 Working with Multiple Analyzers

Multiple FCTracer analyzers can be set up in three ways:

Directly Connected by USB - Two or more analyzers can be connected to a single host PC via USB. In this setup, no additional cables are used (as they are in a Cascaded setup) and the analyzers function as non-cascaded, standalone units. Users toggle back and forth between the units.

Cascaded - Two or more local analyzers linked by BNC. One (or all) of the analyzers then connect via USB to a host PC.

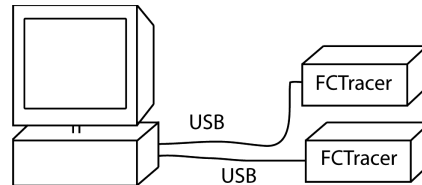
The BNC cable functions to transmit clocking and control information between the analyzers, thereby allowing the analyzers to function as a *cascade* - i.e., a single, logical analyzer. Cascading analyzers allows them to perform synchronized, multi-analyzer recordings.

Connected Remotely over an IP Network - A PC connected to analyzers across an IP network.

3.2 Hardware Setup for Direct USB Connections

Connecting multiple analyzers to a single PC by USB gives you the convenience of being able to control multiple analyzers from a single FCTracer application. The application provides you with a means of toggling back and forth between the analyzers.

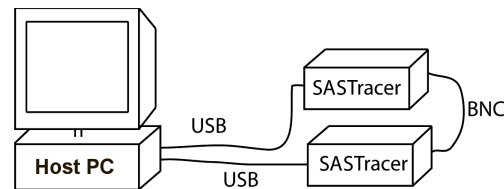
To set up multiple analyzers via USB, you attach USB cables between the analyzers and the host PC as shown in the illustration on the right. If you do not intend to group the analyzers together for synchronized multi-analyzer recordings, no further hardware setup is required. If you do intend to group the analyzers, then you will need to add BNC cables as described in the section below under "Setup for Multiple Analyzer Use." Once the analyzers are connected and started, you can browse to the analyzers via the command **Setup > Analyzer Network ...**



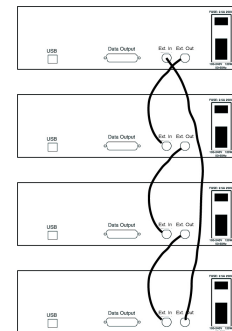
Note The FCTracer software will allow you to toggle between the analyzers but not run two copies of FCTracer software on your screen simultaneously.

3.3 Setup for Cascaded Multiple Analyzer Use

If you add a BNC connection between the analyzers shown above, you create a *cascade* which allows the analyzers to function together as a logical unit. Cascading increases the numbers of ports that can be simultaneously recorded.

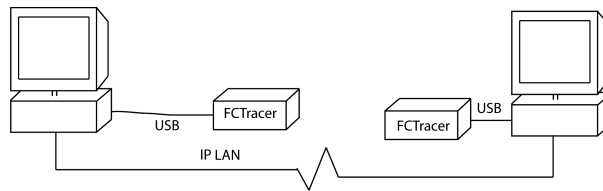


To set up a cascade, you connect a BNC cable between the External Output port on the back of one analyzer to the input port on the second. The first analyzer will serve as the controlling or master analyzer. It will transmit clocking information, Recording Option commands and other data to the other analyzers. If you plan to group three or four analyzers together, daisy-chain the remaining analyzers together, and then loop the output of the last analyzer to the input of the first analyzer as shown in the figure on the right.



3.4 Set Up for Remote Access over an IP LAN

FCTracers can be run remotely over an IP network. In an IP network, the analyzers connect their respective hosts via USB and the hosts, in turn, connect to each other via IP.



Setup involves installing FCTracer software on each analyzer host, then enabling IP LAN connectivity between the hosts.

When the remote analyzer is powered on, you connect remotely control the analyzer via its host. Your connection will be **Local host => Remote host => Analyzer**.

Use the command **Setup > Analyzer Network** to browse to the remote host.

You can cascade IP-connected analyzers by adding BNC connections between the analyzers as described above in “Setup for Cascaded Multiple Analyzer Use” on page 28.

3.5 Configuring the Connection

Once you have completed the physical setup, you are ready to configure the analyzer connection.

USB-Connected Analyzers

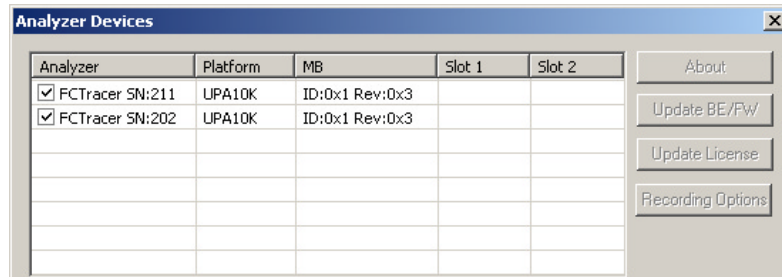
Configuration for two or more USB connected analyzers is minimal.

In the following example, two analyzers are linked via USB to a host PC. You connect to one of the two analyzers.

Step 1 Start the FCTracer analyzers and the FCTracer software.

Step 2 From the menu, select **Setup > Analyzer Devices**.

The Analyzer Devices dialog box opens. The left side of the dialog box has a series of checkboxes. To select an analyzer, check the relevant checkbox on the left.



Step 3 Click **Close**.

The dialog box closes and the analyzer is selected. The FCTracer software on your screen will now control the selected analyzer.

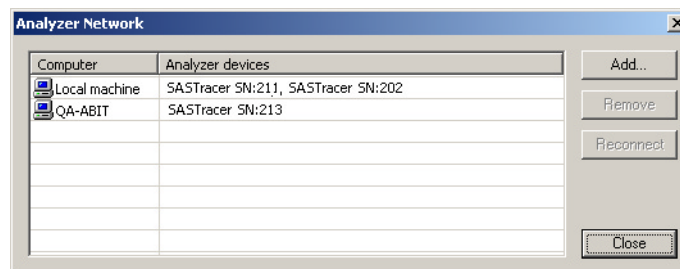
Note You can update the Firmware, BusEngine and License from this dialog by checking an analyzer and then clicking the appropriate button on the right. You can also directly open and set Recording Options for any of the analyzers by checking one or more analyzers and then clicking the Recording Options button. The Recording Options dialog will open. The settings you create will apply to all selected analyzers.

Remote Analyzers Over an IP Network

To configure FCTracer to remotely control an analyzer over an IP LAN, you will need to use the Analyzer Network dialog to browse to the host controlling the analyzer and add both the host and its PC to the dialog.

Step 1 From the menu, select **Setup > Analyzer Network**.

The Analyzer Network dialog box opens. This dialog lists host PCs and their analyzers. The listed devices are either currently connected or were connected at some point previously.



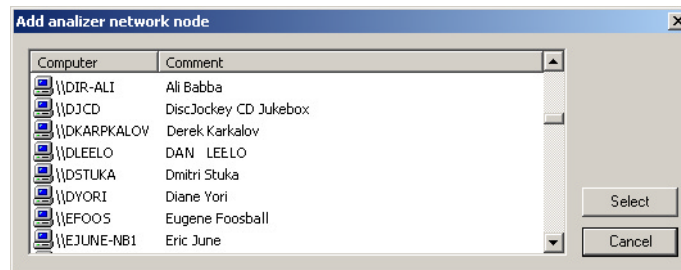
Step 2 Remove any host (other than the Local Machine) from the list by

selecting the host and then clicking **Remove**.

You should keep in the list only the host(s) that you are planning to immediately use.

Step 3 To add a host and analyzer to the list, click **Add**.

A browse dialog box opens.

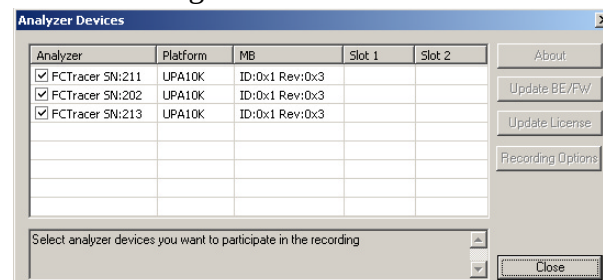


Step 4 Browse to the host that has an analyzer attached to it and double click on it.

Step 5 The host will be added to the Analyzer Network dialog.

Step 6 Click **Close** to close the dialog box.

Step 7 Select **Setup > All Connected Devices ...** to open the Analyzer Devices dialog box.



Step 8 Uncheck all boxes except for the one for the remote analyzer that you wish to connect to.

Step 9 Click **Close** to close the dialog box and establish a connection to the selected analyzer.

Configuring Cascaded Multiple Analyzers

To configure analyzers to work as a group (i.e., into a *cascade*), attach BNC cables as described “Setup for Cascaded Multiple Analyzer Use” on page 28, then perform the following steps:

Step 1 Perform **Steps 1** and **2** as described above in “USB-Connected Analyzers” on page 29.

The Analyzer Devices dialog box will open.

Step 2 In the Analyzer Devices dialog box, verify that the checkboxes are checked for the cascaded analyzers.

Step 3 Click **Close**.

The dialog closes and the analyzers are selected.

Step 4 Test the setup by recording some traffic.

If the analyzers are not connected by the BNC cables, an error message will appear prompting you to correct the problem.

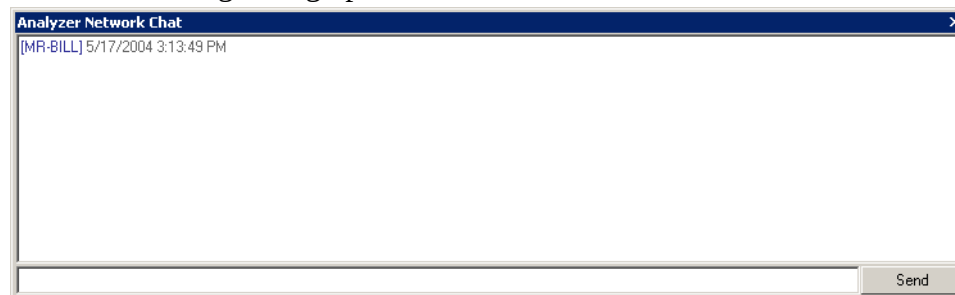
3.6 Network Chat

Analyzer Network Chat is a utility that allows users to conduct chat sessions over an IP LAN.

In order to send and receive electronic text messages, each user must be working with a PC that is attached to an analyzer. And each PC must, in turn, be connected to an IP LAN.

To start a chat session,

Step 1 Select **View > Analyzer Network Chat Bar** from the menu. The following dialog opens.



Step 2 Click in the cell at the bottom of the window and type some text.

Step 3 Click **Send**. The sent text will appear in the top of the window next to your prompt.

3. Updates and Licensing

As CATC makes modifications to FCTracer 4G and FCTracer, it will become necessary to update the FCTracer software, firmware, and/or BusEngine. Updated software can be obtained the CATC website. This chapter describes the update process.

Note: CATC analyzers come with a Three Year Investment Protection Agreement that entitles users to new software. Thereafter, to obtain new software the user will need to renew the CATC Maintenance Agreement. Contact CATC for details.

3.1 Software, Firmware, and BusEngine Revisions

The **Readme.txt** file on the first installation disk or CD-ROM and in the installed directory gives last-minute updates about the current release. Included with each release are the most recent downloadable images of the Firmware and the BusEngine. The **Readme.txt** file lists the latest versions and informs you if new Firmware or a new BusEngine needs to be updated in your hardware.

Once the Analyzer has completed the self diagnostics and is connected to the PC, you can check the latest revision of the software and BusEngine by selecting **About FCTracer** from the Help menu:



About FCTracer details revisions of the following software and hardware:

- FCTracer Software Version
- FCTracer Firmware & ROM Versions
- BusEngine Version
- Unit Serial Number

Note When contacting CATC for technical support, please have available all the revisions reported in the **About FCTracer...** window.

3.2 Software Updates

When a new FCTracer software release is available, it is posted on the Support page of the CATC website at **www.catc.com/support.html**.

To update the FCTracer software,

- Step 1** In the **About FCTracer** screen, verify which version of FCTracer Software you are currently running.
- Step 2** Find the latest released software version on the CATC website under **www.catc.com/support**.
If you are running the latest version of the software, no further action is needed.
*If you are **not** running the latest version, continue to Step 3.*
- Step 3** Click on the first link to download the zipped Disk 1 files for your operating system.
- Step 4** Unzip the files into your choice of directory.
- Step 5** Click **Start**, then **Run**, and browse to where you unzipped the files.
- Step 6** Select the program named **Setup** and click **Open**.
- Step 7** Click **OK** to run the Setup and begin the installation.
- Step 8** Follow the on-screen instructions to complete the installation.
- Step 9** Please see the Readme file on the installation CD for information on changes in the release.

3.3 License Information

Licensing information for FCTracer can be viewed by selecting Display License Information from the Help menu. The License window provides maintenance expiration and features data for FCTracer.

Updating the Software License

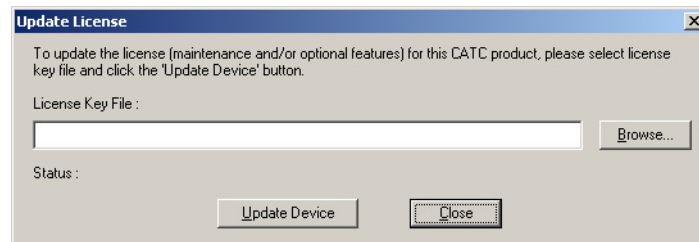
License keys are necessary to enable software maintenance for both FCTracer 4G and for FCTracer. Software maintenance is also needed on FCTracer for and four or eight channel support. If they are not enabled, a message appears if an attempt is made to access these features, stating that a license key is necessary to use the features.

To access these tools, a License Key must be obtained by CATC. Once the License Key is obtained, perform the following steps to install it:

Step 1 From the **Setup** menu, select **All Connected Devices**.

*The **Analyzer Devices** dialog opens.*

Step 2 Click the button **Update License** button. The Update License dialog appears.



Step 3 Enter the path and filename for the License key or use the Browse button to navigate to the directory that contains the License Key.

Step 4 Select the *.lic file, and then click **Update Device**.

3.4 BusEngine and Firmware Updates

BusEngine and Firmware updates often need to be performed when you update the FCTracer software. These updates can be performed automatically or manually. Both processes are described.

Updating the BusEngine

The BusEngine core is the heart of the analyzer. Using FPGA technology, the BusEngine incorporates both the high speed recording engine and the configurable building blocks that implement data/state/error detections, triggering, capture filtering, external signal monitoring, and event counting and sequencing. Both the BusEngine program and the Firmware that manages the internal microcontroller are fully field updateable.

Updating the Firmware

Within a new software release, it may also be necessary to update the analyzer's firmware for proper operation. The Readme file informs you if this is necessary.

Automatic Updates

When the FCTracer software is updated, the software may become incompatible with the BusEngine and Firmware. If a recording is attempted, FCTracer displays a warning message and then automatically begins an update process for the BusEngine and Firmware. If preferred, you can abort this update and do the steps manually, as described later in this chapter.

To automatically update the BusEngine and Firmware,

Step 1 If needed, update the FCTracer software using the steps outlined in "Software Updates" described above.

Step 2 Turn on the Analyzer.

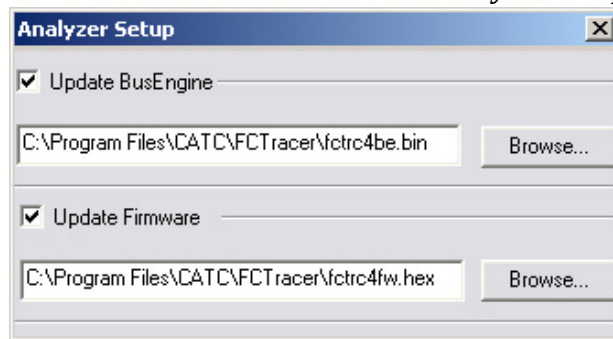
Step 3 On the toolbar, click the  button.

Because the BusEngine and/or the Firmware are incompatible with the current FCTracer software version, an error message will appear displaying your current versions and indicating what versions you need to install.



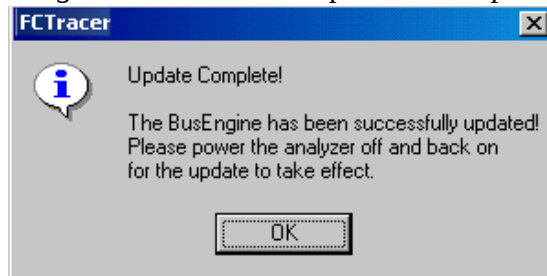
Step 4 Click Yes.

*The above window closes and the **Analyzer Setup** window opens.*



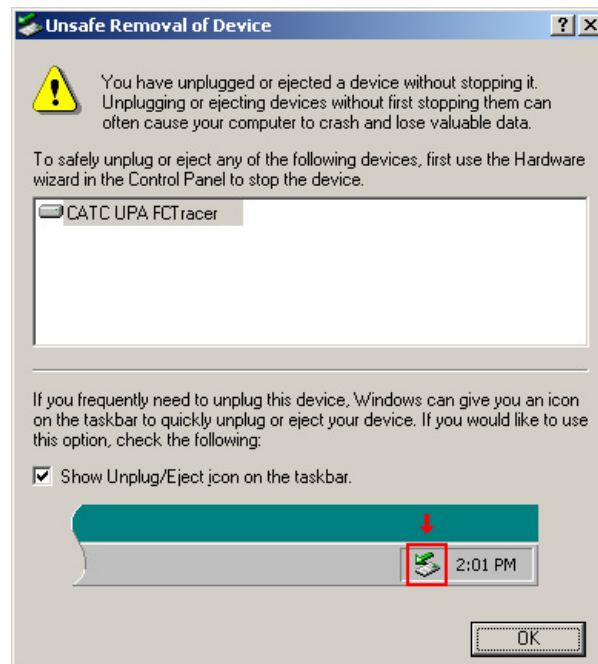
Step 5 Check **Update BusEngine** or **Update Firmware** on the **Analyzer Setup** screen.

If you are running Windows 98SE, you will get the following message when the second update is completed:



Step 6 Power cycle FCTracer to complete the update.

Note You must power cycle the analyzer for all BusEngine updates.



Manual Updates

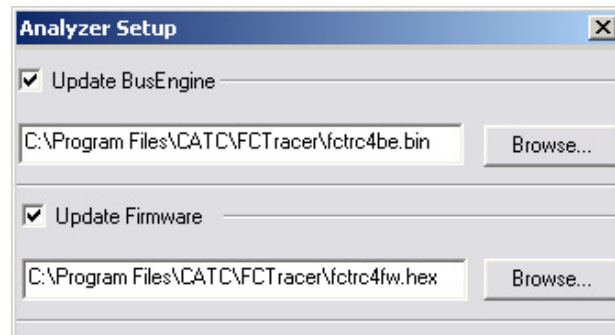
You can manually update the BusEngine by following these steps:

Step 1 Select **Setup > All Connected Devices** on the Menu Bar.

The Analyzer Devices dialog box opens.

Step 2 Select **Update BE/FW**.

*The **Analyzer Setup** screen opens:*

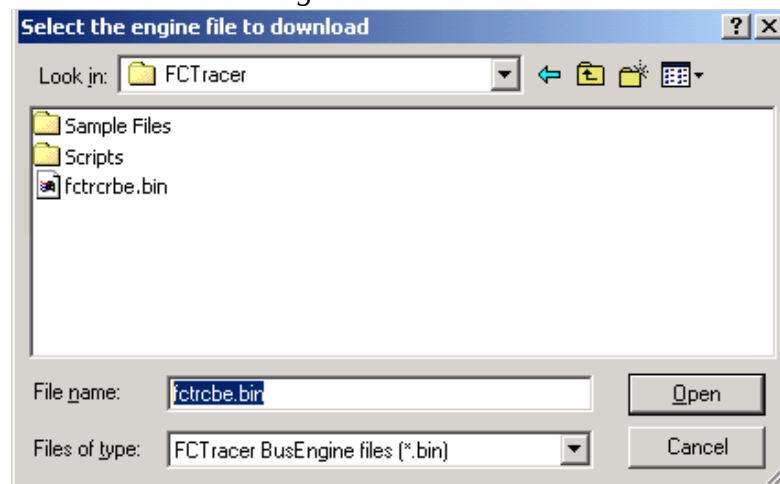


To update the BusEngine,

Step 3 Click **Update BusEngine** on the **Analyzer Setup** screen.

Step 4 If you need to browse to locate the BusEngine or Firmware files, click **Browse ...**

You see a browse dialog like one below:



*The program has already automatically searched for the correct file and displays it in the **File name** field.*

Note The most current BusEngine file (**fctrcbe.bin**) was copied to your \CATC\FCTracer directory when you installed the program.

Step 5 Click **Open**.

Step 6 Power cycle the Analyzer.

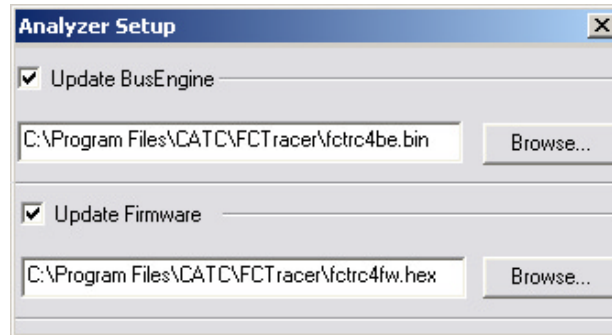
Re-initialization takes a couple of minutes.

Manually Updating the Firmware

To manually update the firmware,

Step 1 Select **Update BE/FW** from the **Analyzer Devices** dialog box.

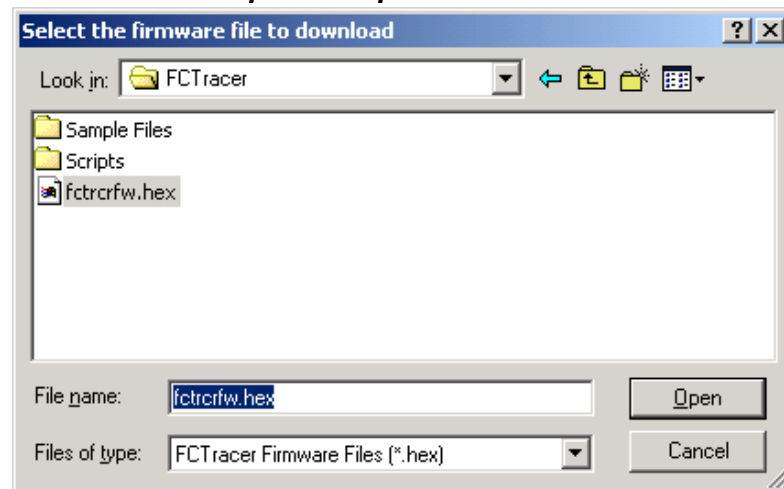
*The **Analyzer Setup** screen opens:*



Step 1 Click **Setup** screen.

Step 2 If you need to locate the correct Firmware file, click **Browse ...**

*You see the **Select firmware file** window:*



*The program has already automatically searched for the correct file and displays it in the **File name** field.*

Step 3 Click **Open**.

The Analyzer updates the Firmware.

Step 4 Unplug the USB cable from the back of the Analyzer unit and then reinsert it so the new Firmware update can take effect.

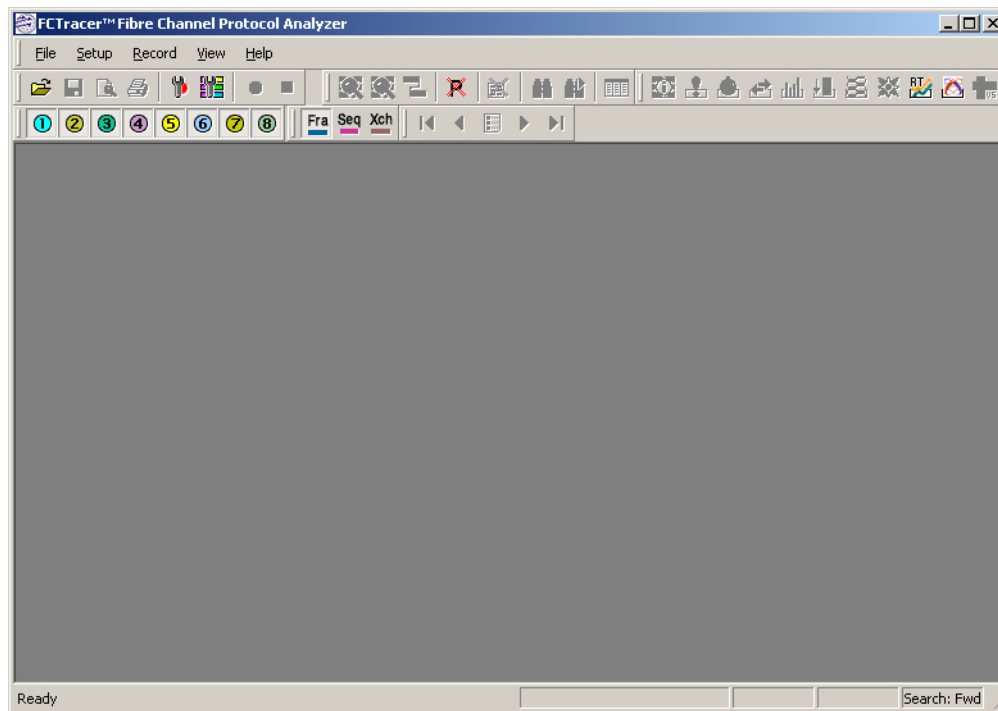
4. Software Overview

The *FCTracer* application administers the analyzer and provides an interface for displaying, analyzing, and printing captured protocol traffic. The software may be used with or without the analyzer. This chapter describes the menus, toolbars and other features of the software.

4.1 Starting the FCTracer Program

To start the *FCTracer* Program from the Start menu,

Step 1 Click **Start > Programs > CATC > CATC FCTracer**.



4.2 Opening Sample Traces

A good way to gain familiarity with *FCTracer* is to open some of the provided sample files and explore the menus, pop-up menus, and reports.

4.3 Tool Tips

Throughout the application, Tool Tips provide useful information about buttons on the toolbar.

To display a Tool Tip, position the mouse pointer over an item of interest such as part of the trace or a button.



4.4 Trace Tool-Tips

Many fields within the Trace will display tool-tips when the mouse pointer is suspended over them. These tips may provide a simple legend for the cell or may give substantial added details about the field.

OPNyx	AL_PD	AL_PS	TimeDelta	Time Stamp
K28.5 D17.4 D01.0	0x01	0xEF	15.000 ps	00:00:00.037
Primitive Signal OPNyx				
OPNyx	Description:		Open full-duplex	
K28.5 D17.4 D01.0	Arbitrated Loop Destination Address:		0x01	
ARB(val)	Arbitrated Loop Source Address:		0xEF	
K28.5 D20.4 D16.7	Code:		K28.5 D17.4 D01.0 D15.7	
ARB(val)	Dword:		0xBC9101EF	

4.5 The Main Display Menus

While some of the analyzer's Main Display window options are familiar, many contain options specific to the analyzer program.

Table 1: Main Display Pull-Down Menus

Menu	Function
File	
<u>O</u> pen...	Opens a trace file.
<u>C</u> lose	Closes the current file.
Save <u>A</u> s...	Saves all or a specified range of packets from the current file with a specified name.
<u>P</u> rint...	Prints part or all of the current trace file.
Print <u>P</u> review	Displays an on-screen preview before printing.
<u>P</u> rint Setup...	Sets up your current or new printer.
<u>E</u> dit Comment...	Creates or edits the Trace file comment field.
Export>>	Packets to Text (Packet View Format) - Saves all or part of a Trace to a text file. Useful for saving traces to floppy disk and for emailing. Packets to EAS Format ... - Creates an EAS file based on the open trace. Running this command opens a dialog prompting you for a file name, path, and a range of Frames to be exported.
<i>Last File</i>	Lists the last files that were opened.
<u>E</u> xit	Exits the FCTracer program.

Menu	Function
Setup	
Display Options...	Provides the control of various display options such as color, formats, and filters.
Recording Options...	Provides setup options for recording, triggering events, and filtering events.
Application Preferences ...	Sets how commands are listed in menus and dialog boxes.
Update BE/FW ...	Allows the operator to reset the Analyzer or update the BusEngine and Firmware.
Channel Settings ...	Allows channel names to be customized.
Analyzer Network ...	Opens a dialog box that lets you browse for local and networked analyzers. To browse for a networked analyzer, select Add, then browse to the PC host that is attached to the analyzer, then select the attached analyzer.
All Connected Devices ...	Opens a dialog box with a list of analyzers connected to the host PC. Lets you select an analyzer and update the BusEngine, Firmware, and licensing information.
Record	
Start	Causes the Analyzer to begin recording Fibre Channel activity.
Stop	Causes the Analyzer to stop recording Fibre Channel activity.
Report	
File Information	Summarizes key facts, such as the number of packets and triggering setup.
Error Summary	Displays an error summary of the current trace file and allows you to go to a specific frame, sequence, or exchange, and save the error file to a uniquely named file.
Timing Calculation	Starts the calculator dialog for calculating various timing and bandwidth parameters in the recording file.
Traffic Summary	Summarizes in table format the number and types of packets that were transferred during the recording.
Bus Utilization	Opens a window with graphs of bus usage for the open trace.
Run Verification Scripts ...	Opens a window for running performance tests of Fibre Channel traffic recorded by FCTracer 4G or FCTracer. These tests evaluate the timing and data of events in accordance with user-defined conditions.
Link Tracker	Opens a window for displaying a detailed chronological view of Bus activity on a Primitive-by-Primitive basis.
Frame Tracker	Opens a window for displaying a detailed chronological view of traffic on a Frame-by-Frame basis.

Menu	Function
Search	
Go to Trigger	Positions the display to the first frame, sequence, or exchange following the trigger event.
Go to Frame/ Sequence/Exchange...	Positions the display to the indicated Frame, Sequence, or Exchange.
Go to Time ...	Positions the display to a specific time.
Go to <u>M</u> arker »	Positions the display to a previously marked frame, sequence, or exchange.
Go to »	Enables searching for specific events using a cascade of pop-up menus.
Find	Allows complex searches.
Find <u>N</u> ext	Repeats the previous Find operation. Also use F3 to find next.
Search Direction	Allows you to specify a forward or backward search of a trace file.
View	
<u>T</u> oolbars	Displays list of available toolbars. Has a customize command for creating.
Analyzer Network Chat Bar	Opens a dialog for chatting with other analyzer users. This option works only with PCs directly.
<u>S</u> tatus Bar	Switches display of the Status Bar on or off.
Real-Time Statistics	Opens a window that displays graphs of traffic in real-time.
Zoom In	Zoom in increases the size of the displayed elements.
Zoom Out	Zoom out decreases the size of the displayed elements.
Wrap	Allows the display to wrap.
Decoding Assignments	Opens a dialog box called FCP SCSI Decoding Settings that lets you correct problems with SCSI decoding by assigning a SCSI command set. This dialog box provides a way of resolving discrepancies caused by the sharing of the same Opcode by different SCSI command sets.
Frames Level	View/Hide Frames Level.
Sequences Level	View/Hide Sequences Level.
Exchanges Level	View/Hide Exchanges Level.
First Segment	Opens the first segment in a multi-segment trace. Requires that a multi-segmented file be opened first.
Previous Segment	Opens the previous segment in a multi-segment trace.
Index File	Opens the index file for a multi-segmented trace. The index file summarizes the trace and its segments.
Next Segment	Opens the next segment in a multi-segment trace.
Last Segment	Opens the last segment in a multi-segment trace.

Menu	Function
Window	
<u>N</u> ew Window	Switches display of the Tool Bar on or off.
<u>C</u> ascade	Displays all open windows in an overlapping arrangement.
<u>T</u> ile	Displays all open windows in a side-by-side arrangement.
Arrange Icons	Arranges minimized windows at the bottom of the display.
<u>W</u> indows	Displays a list of open windows.
Help	
<u>H</u> elp Topics	Displays online help.
Update License	Displays a dialog box for entering updated license information.
Display License Information	Displays version information about FCTracer, its firmware, and BusEngine.
<u>A</u> bout FCTracer	Displays version information about FCTracer.

4.6 View Options

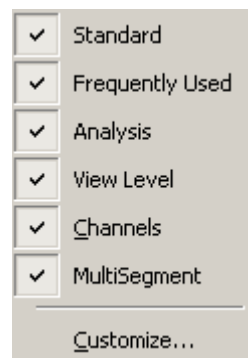
You can hide, display or reset toolbars by selecting **View > Toolbars** from the menu bar.

Resetting the Toolbar

From time to time (such as following a software upgrade) it is possible for the buttons on the toolbar to not match their intended function.

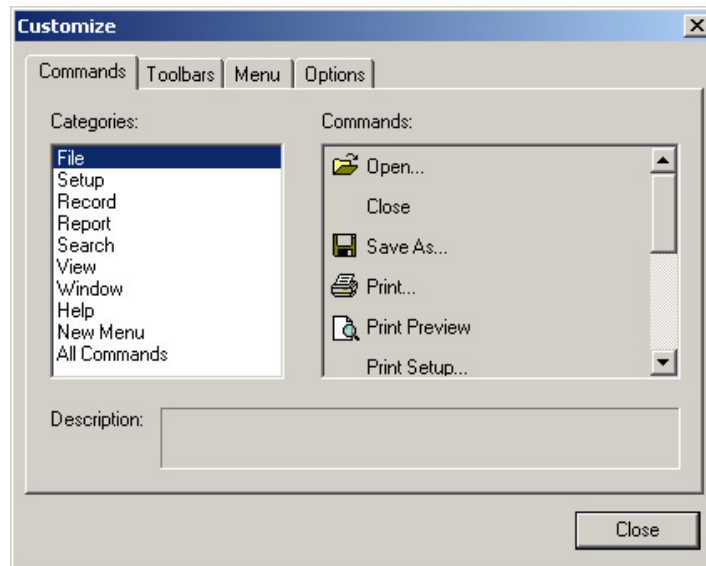
To reset the toolbar,

Step 1 Select **View > Toolbars** from the menu bar.



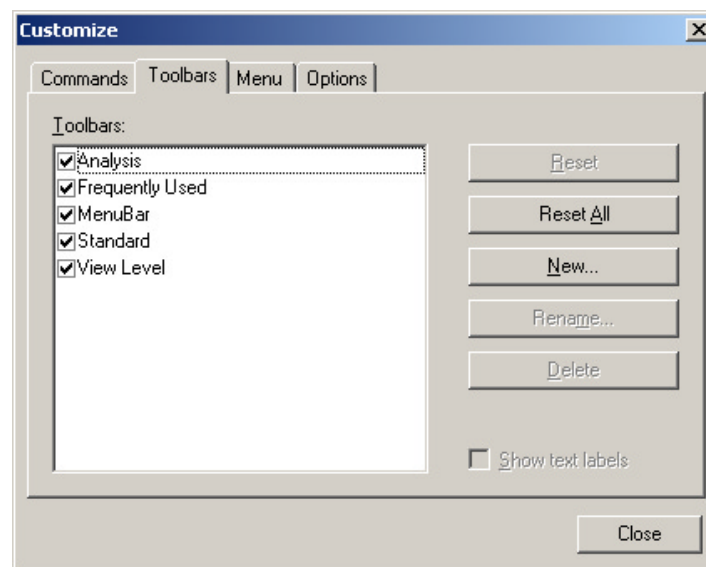
Step 2 Select **Customize** from the sub-menu.

The following dialog box will open.



Step 3 Select the **Toolbars** tab.

The following dialog box will open.



Step 4 Click the **Reset All** button.

The toolbar resets to the factory defaults.

Tool Bar



The Tool Bar provides quick access to most of the FCTracer software functions. You can learn the function of each button by passing the mouse pointer over them. Descriptions of the buttons appear on the status bar at the bottom of the window and as tooltips above each button.

	Open file		Stop Recording
	Save As		Re-upload. This button appears in the toolbar if Stop is pressed during an upload. Causes analyzer to re-upload trace from analyzer buffer to the PC. Gives options for selecting which part of the trace you want uploaded.
	Preview		Zoom In
	Print...		Zoom Out
	Edit as text - opens a text editor for editing traffic generation files.		Wrap
	Setup Record Options		Find - Opens a dialog for conducting complex searches
	Setup Display Options		Find Next - repeats last Find or Go To operation
	Start Recording		Trace Panes. Allows multiple traces to be locked together and scrolled in tandem. This option only works with .mtt traces created by multi-analyzer cascades in a single recording session.

Decode Buttons

	Decode & display Frame Layer (Frames & Primitives)		Decode & display SCSI Application Layer (SCSI Commands)
	Decode & display Sequence Layer		

Hide Buttons

	Hide Align and Notify Primitives		Hide Initiator Channel 1
	Hide RRDY Primitives		Hide Target Channel 1

Reports Buttons



File Information Report. Opens a summary of the trace file including when it was made, the Recording Options used to create the file, and data on the analyzer that recorded the trace.



Error Report. Opens the Traffic Summary window and displays a summary of errors in the trace.



Timing and Bus Usage Calculations. Opens a calculator for measuring timing between Frames.



Show Data Block. Opens a dialog for navigating to data blocks within Frames. Once a data block is located, the window can display the data in a variety of formats.



Traffic Summary. Opens a window displaying a table summary of traffic recorded in the trace.



Bus Utilization. Presents a graphical summary of traffic in the trace.



Show Link Tracker. Opens window with detailed chronological view of traffic on a Primitive-by-Primitive basis.



Show Frame Tracker. Opens window with detailed chronological view of traffic on a Frame-by-Frame basis.



Invokes FC-Auditor application, if installed. FC-Auditor performs performance testing on traces. Auditor requires that traces be converted into a format called EAS via the command File > Export > Packets to EAS format.



Run Verification Scripts. Opens a window for running performance tests of Fibre Channel traffic.

Multi-Segment Tool Bar



The Multi-Segment Tool Bar lets you navigate forward and backward through traces that have been divided into segments via the **Save As Multi-Segment Trace** option in the Recording Options General dialog (see “Save As Multisegment Trace” on page 56 for further details.)



Show first multisegment file



Show next multisegment file



Show previous multisegment file



Show last multisegment file



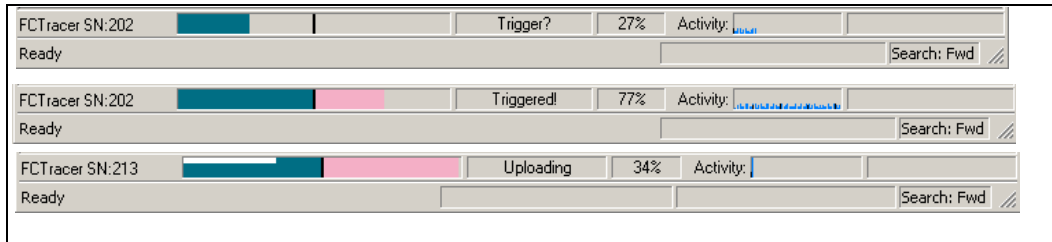
Show multisegment index file

4.7 Status Bar

The Status Bar is located at the bottom of the main display window. Depending on the current activity, the bar can be divided into as many as four segments.

Recording Progress

When you begin recording, the left-most segment of the Status Bar displays a Recording Progress Indicator:



As recording progresses, the Progress Indicator changes to reflect the recording progress graphically:

- In the Progress Indicator, a black vertical line illustrates the location of the Trigger Position you selected in Recording Options.
 - Pre-Trigger progress is displayed in the field to the left of the Trigger Position in the before-Trigger color specified in the Display Options.
 - When the Trigger Position is reached, the progress indicator wiggles as it waits for the trigger.
 - After the trigger occurs, the field to the right of the Trigger Position fills in the post-Trigger color specified in the Display Options.
 - When recording is complete, the upper half of the progress indicator fills in white, indicating the progress of the data upload to the host computer.

You should be aware of two exceptional conditions:

- If a Trigger event occurs during the before-Trigger recording, the before-Trigger color changes to the after-Trigger color to indicate that not all the expected data was recorded pre-Trigger.
- When you click **Stop** before or after a Trigger event, the Progress Bar adjusts accordingly to begin uploading the most recently recorded data.

If you wish to abort an upload that is in progress, click the **Stop** button again.

The Progress Bar fills with color in proportion to the specified size and actual rate at which the hardware is writing and reading the recording memory. However, the Progress Indicator is normalized to fill the space within the Status Bar.

Recording Status

During recording activity, the current Recording Status is temporarily displayed in the next segment. When you activate the **Record** function, this segment flashes one of the following messages (depending on the selected Recording Options):

- Trigger?
- Triggered!
- Uploading

After recording stops,

- The flashing message changes to **Uploading data—x% done** (x% indicates the percentage completion of the data uploading process).
- The traffic data is copied to disk (overwriting any previous version of this file) using the default file name **data.fct** or a new name specified in the Recording options.

To abort the upload process,

Press **Esc** on your keyboard

OR

Again click  in the Tool Bar.

You are prompted to choose whether to keep the partially uploaded data or to throw it away.

When the data is saved, the Recorded Data file appears in the main display window and the Recording Status window is cleared.

- If the recording resulted from a Trigger Event, the first frame, sequence, or exchange following the Trigger (or the frame, sequence, or exchange that caused the Trigger) is initially positioned second from the top of the display.
- If the recording did not result from a Trigger Event, the display begins with the first frame, sequence, or exchange in the traffic file.

Analyzer Status

The third segment in the status bar displays analyzer status. During uploading, this segment displays the percent of the upload process completed.

Note If packets are filtered from the recording or data are truncated, the recording activity is reduced.

Activity

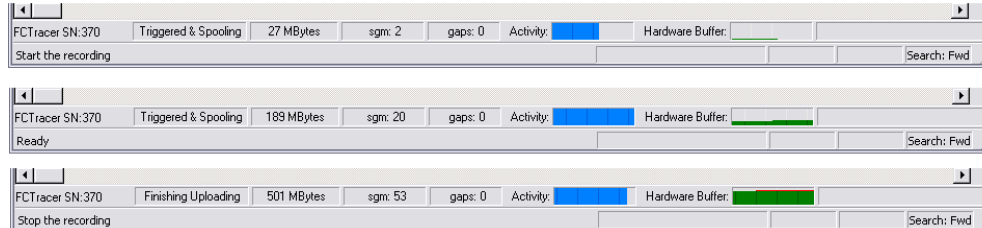
The Activity segment indicates the amount of Fibre Channel activity that the analyzer is currently detecting from the device(s) under test.

Search Status

The rightmost segment displays the current search direction: **Fwd** (forward) or **Bwd** (backward).

Status Bar - Spooled Recordings

During spooled recordings, the status bar indicates that spooled recording is underway and shows the name and progress of the segment currently being recorded.



Zoom In

Zoom In increases the size of the displayed elements, allowing fewer (but larger) frame, sequence, or exchange fields per screen.

Click  on the Tool Bar.

Zoom Out

Zoom Out decreases the size of the displayed elements, allowing more (but smaller) frame, sequence, or exchange fields per screen.

Click  on the Tool Bar.

4.8 Analyzer Keyboard Shortcuts

The following table shows the keyboard shortcuts available in FCTracer and FCTracer 4G.

Table 2: Keyboard Shortcuts

Key Combination	Operation
Ctrl+O	Open the file
Ctrl+P	Print
Ctrl+S	Save the file
Ctrl+Home	Jump to first frame, sequence, or exchange
Ctrl+End	Jump to last frame, sequence, or exchange
F3	Find Next
F6	Next Pane
Shift+F6	Previous Pane
Ctrl+B	Search Backward
Ctrl+F	Search Forward
Shift+Insert	Paste
Ctrl+Home	Jump to first frame, sequence, or exchange
Ctrl+R	Start recording
Ctrl+T	Stop recording

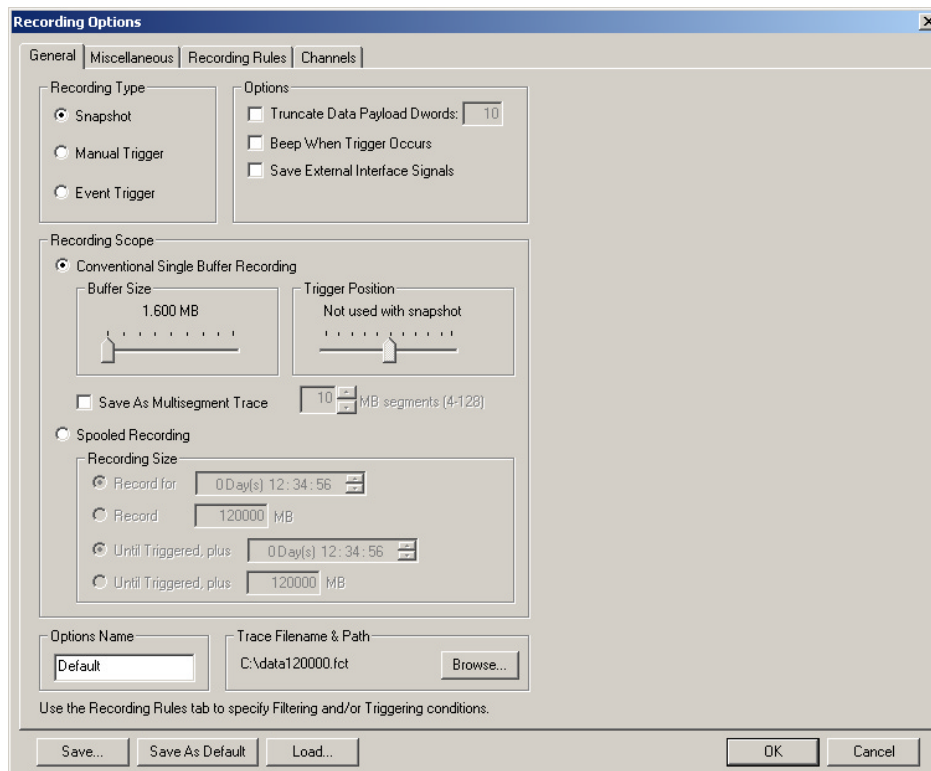
5. Recording Options

The **Recording Options** dialog box controls how FCTracer records Fibre Channel data. At the top of the Recording Options dialog box are four tabs that provide access to options pages called General, Miscellaneous, Recording Rules, and Channels. Using these pages, you can configure FCTracer to create event triggers, increase or decrease memory allocation for recording, and interact with other Fibre Channel devices in different ways.

5.1 Opening the Recording Options Dialog Box

From the **Setup** menu, select **Recording Options...**

The **Recording Options** window appears displaying the General tab.

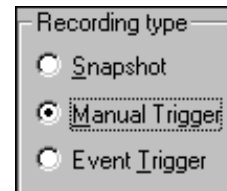


5.2 Recording Options - General

The General tab opens a window shown in the previous illustration made up of five main boxes marked *Recording Type*, *Buffer Size*, *Trigger Position*, *Options*, and *Recording Scope*.

Recording type

The **Recording Type** box presents three options that allow you to set how FCTracer begins and ends a recording. The options are: *Snapshot*, *Manual Trigger*, and *Event Trigger*.



Snapshot

A Snapshot is a fixed-length recording. You can set the size two ways: by adjusting the "Buffer Size" slide bar dialog or by clicking the Stop button any time during the recording. Recording begins by clicking the Start button  on the Tool Bar and ends when either the selected buffer size is filled or you press the Stop button.

Manual Trigger

A Manual Trigger is a recording whose Trigger point is activated by pressing the Trigger button on the front panel.

Recording is begun by pressing the Start button  on the Tool Bar. Recording continues in a circular manner within the limits set by the buffer size. Recording ends when the Stop button  is clicked on the Tool Bar or when the Trigger button is pressed on the analyzer's front panel. If you press the Trigger button, recording will continue until the post-trigger memory has been filled. Thus, for example, if you set the Recording Buffer to 10 MB and the Trigger Point to 50%, pressing the Manual Trigger button will cause the analyzer to preserve 5 MB of pre-trigger and 5 MB of post-trigger traffic.

Event Trigger

An Event Trigger is a recording whose ending is triggered by a specific event or events. Before recording begins, you define the event trigger in the Recording Rules page in the Recording Options dialog box (accessible by selecting **Setup > Recording Options > Recording Rules** from the menu). You begin the recording by clicking the Start button on the Tool Bar. Recording continues in a circular manner within the limits set by the buffer size. Once the trigger event occurs, some post-trigger recording occurs, then the recording ends.

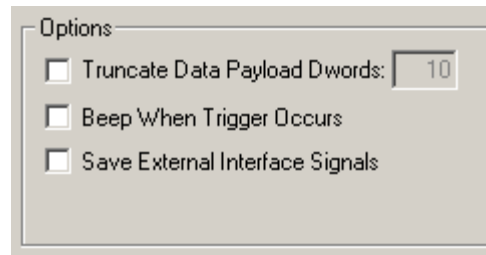
Note In this mode, the recording can be stopped manually in the same way as for "manual trigger" mode.

Options

The Options box contains the following:

Truncate Data Payload Dwords

If selected, allows Data Payload Dwords to be truncated during a recording in order to preserve recording memory. To set the length of the truncated Data Payload Dword, enter a value into the box on the right.



Beep When Trigger Occurs

Causes the PC to beep when a trigger event has occurred.

Save External Interface Signals

Causes the analyzer to save external interface signals from a break-out board as fields in the trace.

5.3 Recording Scope

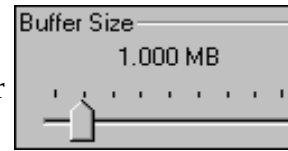
Recording Scope controls the maximum size of a recording and how it is uploaded from the analyzer to the host PC. Recording Scope has two settings: **Conventional** recording and **Spooled** recording. Conventional recordings have a maximum size limit of 2 GB and are used for recordings lasting several minutes. Spooled recordings have no built-in size limitation and can be used for recordings lasting hours or even days.

5.4 Conventional Single Buffer Recording

In a Conventional recording, the entire trace is recorded and stored in the analyzer buffer before it is uploaded to the host PC. Recordings are thus limited in size to the size of the analyzer buffer - or 2 GB. If you are planning to create a moderate-sized recording, this is a good option to select. You set the buffer size and the trigger position, then begin the recording. The analyzer's buffer fills, then the traffic is uploaded to the host PC.

If you are planning to create a large conventional recordings, you might consider enabling **Multi-segmenting**. Multi-segmenting divides the trace into segments. This makes it easier to navigate the trace.

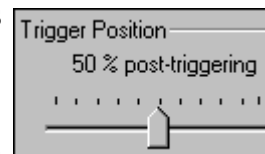
Buffer Size - The Buffer Size slide bar adjusts the recording buffer size from 1.6 megabytes to 2048 MB. This option is used for setting the memory for a Conventional recording.



The Recording Type option determines how this buffer is used. Although there are 2048 MB of physical memory in the Analyzer, the efficiency of the recording ranges from 2:1 to 4:1 ratios of physical memory to actual Fibre Channel traffic. Shorter Fibre Channel packets yield a less efficient recording. The non-traffic portion of physical memory is utilized for control and timing information.

Note The scale is not linear and affords more granularity in the smaller buffer sizes.

Trigger Position - The Trigger Position slide bar sets the amount of pre- and post-trigger recording in a Conventional recording. It also allows adjustment of the location of the trigger within the defined buffer.



You can adjust the Triggering Position between 1 and 99% post-Trigger. **Trigger Position** is available only when **Manual Trigger** or **Event Trigger** is selected as **Recording type**.

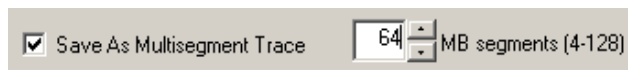
As an example, if the buffer size is set to 16MB, then for the following Trigger Position settings, the amount of pre- and post-Trigger data is

- 95% post-triggering: 0.8MB pre-trigger, 15.2MB post-trigger
- 75% post-triggering: 4MB pre-trigger, 12MB post-trigger
- 50% post-triggering: 8MB pre-trigger, 8MB post-trigger
- 25% post-triggering: 12MB pre-trigger, 4MB post-trigger
- 5% post-triggering: 15.2MB pre-trigger, 0.8MB post-trigger

Note When a Trigger occurs, recording continues until the post-Trigger amount of the buffer is filled.

5.5 Save As Multisegment Trace

This option causes the analyzer to segment the trace into multiple files and create an index file called *data.mlt* that summarizes the starting and finishing frame for each segment.



This option is useful for very large recordings and for host PCs with limited memory. In the latter case, multi-segmenting gives a PC with limited memory a way to open recordings that would otherwise be too large to open.

The only downside to multi-segmenting is that limits the scope of reports such as Traffic Summary, Bus Utilization, and Error Summary to each of the segments. You will not be able to perform summary statistics on the full recording.

The default value for this option is 64 MB. Before attempting large recordings, it is recommended that you play with this number to see what value best suits your needs.

To create a multisegmented trace,

Step 1 Check the box marked **Save As Multisegmented Trace**.

Step 2 Set the file size for each segment in the box marked **MB Segments**.

File Structure for Segmented Files

Multisegmenting produces an index file and segmented trace files. The default name of the index file is *dataXYZ.mlt*, where XYZ is the last three digits of the analyzer's serial number. (You can see the unit's serial number by selecting Help > About FCTracer.) Thus, for example, if you had an analyzer with the serial number 111, the index file would be called *data111.mlt*.

The index file and the segmented trace files are stored in a directory named after the index file. The directory is named *indexfilename_mlt_files*. For example, if the index file is named *data111.mlt*, the directory will be named *data111_mlt_files*. Below this directory additional, sequentially numbered sub-directories (up to 100,000) that house the segmented trace files. These sub-directories bear simple numerical names: 00000 - 00999. Each of these subdirectories can hold up to 100 sequentially-numbered segment files. Collectively, the entire directory structure can hold up to 10 million files.

Example

A 1010 MB recording using 10 MB segments and the default file names will create the following sub-directories and files. The example below uses the serial number 111:

- data111.mlt This is the index file.
- data111_mlt_files\00000\segment_00000.fct
- data111_mlt_files\00000\segment_00001.fct
- ...
- data111_mlt_files\00000\segment_00099.fct

- data111_mlt_files\00001\segment_00100.fct
- data111_mlt_files\00001\segment_00101.fct

The index file looks something like a trace file but contains packet-like entities that summarize each 10 MB segment.

The screenshot shows the CATC FCTracer(TM) Fibre Channel Protocol Analyzer window. The main display area contains a table with the following data:

Segment	Packet Types	Start Frame #	Num Frames	Duration	Time Stamp
0	DataFrame	0	87678	13.150 sec	00 : 00 : 00 . 000 026 660
1	DataFrame	87678	87708	13.337 sec	00 : 00 : 13 . 149 870 307
2	DataFrame	175386	87777	13.200 sec	00 : 00 : 26 . 486 897 000
3	DataFrame	263163	7828	1.186 sec	00 : 00 : 39 . 686 609 887

When uploading is complete, the index file will be opened. Each "packet" in this file corresponds to one of the numbered segments. Double clicking on the packet will open the corresponding segment file.

Multisegement Toolbar



When an index file is opened like the one shown above, the Multisegment Toolbar will display. This toolbar lets you navigate the index file.

	Open first segment in multisegment trace.
	Open previous segment in multisegment trace.
	Open index file. This button becomes active if a multisegment trace file is open.
	Open next segment in multisegment trace.
	Open last segment in multisegment trace.

5.6 Spooled Recordings

In a Spooled recording, uploading commences from the analyzer to the host PC when the recording is begun. As traffic is uploaded, the analyzer memory is freed - creating space for recording additional traffic. Recording can thus continue for long periods of time, and create file lengths well in excess of 2 GBs.

Recording Size

With Spooled Recordings, you are given the option of setting the recording length based on time or on the recording size.

Record for - Enter the duration of the recording in days, hours, minutes, and seconds.

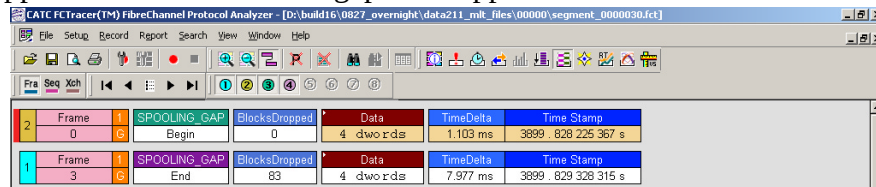
Record - Enter the amount of traffic (in MB) that you want the analyzer to record. Selecting this option will create a fixed length recording that begins as soon as you click the REC button on the menu bar.

Until Triggered, plus - Enter the amount of traffic (in time) that you want the analyzer to record following an event trigger. Recording time units are days, hours, minutes, and seconds.

Until Triggered, plus - Enter the amount of traffic (in MB) that you want the analyzer to record following an event trigger. You select event triggers in the Recording Rules page -- see **“Recording Options - Recording Rules” on page 63** for details.

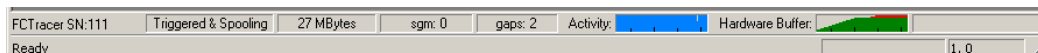
Spooled Recordings - Performance Issues

During a spooled recording if the analyzer buffer fills faster than the trace can be uploaded to the host PC, the analyzer will briefly suspend recording until some of the buffer is free. When recording is suspended, gaps will appear in the trace. These gaps will appear as entries in the trace.



Frame	SPOOLING_GAP	BlocksDropped	Data	TimeDelta	Time Stamp
0	Begin	0	4 dwords	1.103 ms	3899.828 225 367 s
3	End	83	4 dwords	7.977 ms	3899.829 328 315 s

During the recording, you can see if gaps are likely to happen by reading the status bar at the bottom of the screen.



The Status bar has two fields that you can use to determine if gaps are occurring or are about to occur.

gaps - Shows how many gaps have occurred. In the example above, two gaps have occurred.

Hardware Buffer - shows you how full the analyzer buffer is and if the analyzer is currently dropping packets. In the example above, Hardware Buffer field shows that the buffer is full (shown by the thick green graph) and that the analyzer is currently dropping packets (shown by thin red line atop of the green graph.)

Preventing Gaps

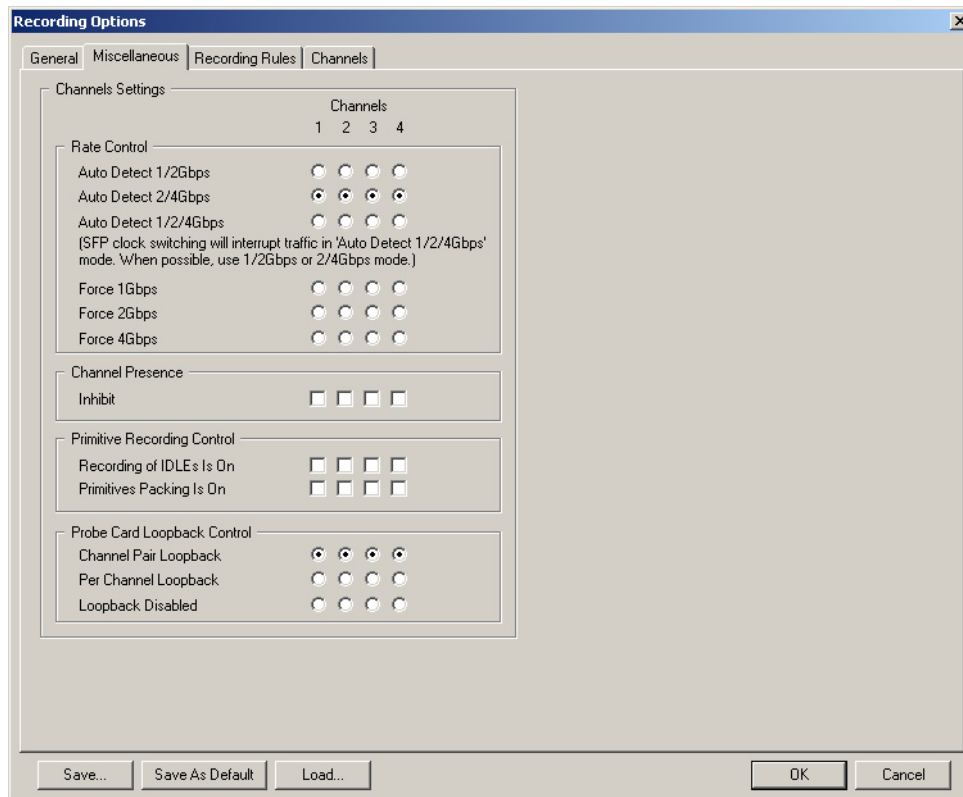
Gaps can be caused by a number of factors - the number of channels being recorded, the absence of filtering, the performance of the host PC (for example, is it using USB 2.0 to upload traffic?), and the amount of traffic produced by the devices under test.

There are several ways to prevent gaps. You will need to experiment with your setup to determine what works best for you. You might try filtering out primitives, turning on data truncation (for example to 10 Dwords) and filtering out LISMs. If you want to record primitives, it is recommended that you enable primitive packing.

5.7 Recording Options - Miscellaneous

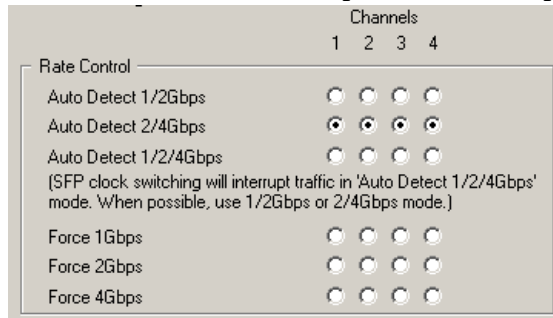
The **Miscellaneous** page in the Recording Options dialog box lets you set bitrates, loopback and other conditions on a channel-by-channel basis.

Note The following screenshots of the Miscellaneous page for are **FCTracer 4G**. The **FCTracer** Miscellaneous page shows eight channels and omits the 4G options.



Rate Control

The Rate Control option allows you to specify the capture rate used by FCTracer. By default, FCTracer autonegotiates the transfer speed on the link and records data at both 1 and 2 Gbps transmitted speed.

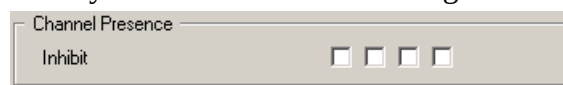


Note - Selecting these speeds has no effect on the actual speed of the link. These speeds only effect how the FCTracer analyzes the traffic.

- **Auto Detect 1/2 Gbps** - Select this option to allow the analyzer to auto-detect a 1 or 2 Gbps transmission rate.
- **Auto Detect 2/4 Gbps** - This is the default Rate Control setting. Select this option to allow the analyzer to auto-detect a 2 or 4 Gbps transmission rate. This is the default Rate Control setting.
- **Force 1Gbps** - Select this capture rate to switch the FCTracer analysis hardware into 1Gbps recording mode. This option is useful for restricting the analysis to 1Gbps transfers by preventing the recording of any signals transmitted at the higher 2Gbps and 4 Gbps rates.
- **Force 2Gbps** - Select this capture rate to switch the FCTracer analysis hardware into 2Gbps recording mode. This option is useful for restricting the analysis to 2Gbps transfers by preventing the recording of any signals transmitted at the 1Gbps and 4 Gbps rates.
- **Force 4 Gbps** - Select this capture rate to switch the FCTracer analysis hardware into 4Gbps recording mode. This option is useful for restricting the analysis to 4Gbps transfers by preventing the recording of any signals transmitted at the 1Gbps and 2 Gbps rates.

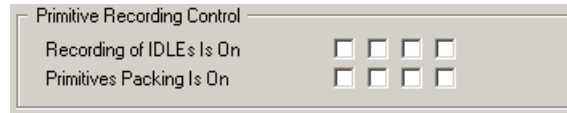
Channel Presence

Channel Presence is a global setting that allows you to include or exclude individual channels from the recording. When you select **Inhibit** for a specific channel, no traffic received on that channel will be recorded. This option is useful for eliminating unnecessary channels from the analysis and increasing memory available for the remaining channels.



Primitive Recording Control

Use this setting to disable the recording of Idles or Primitive Packing.

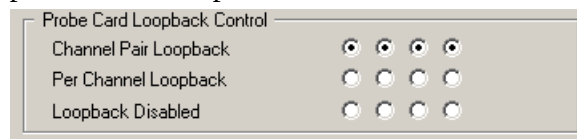
A dialog box titled "Primitive Recording Control" with two rows of checkboxes. The first row is "Recording of IDLEs Is On" and the second row is "Primitives Packing Is On". Each row has four checkboxes, all of which are currently unchecked.

Primitive Recording Control				
Recording of IDLEs Is On	☐	☐	☐	☐
Primitives Packing Is On	☐	☐	☐	☐

- **Recording of IDLEs Is On** - Select this option to enable the recording of IDLE primitives in a trace. Although IDLEs are not important in performing protocol level analysis they might be needed for verifying certain compliances to the Fibre Channel Specification. All data frames must be separated by a minimum of three IDLE primitives for use in clock rate matching. Under normal use, this option can be disabled.
- **Primitive Packing Is On** - Select this option to enable packing of up to 256 primitives per recording entry. This feature can be used to significantly reduce the amount of recording memory used for storing primitives.

Loopback Control

Use these options to set loopback control for the various channels.

A dialog box titled "Probe Card Loopback Control" with three rows of radio buttons. The first row is "Channel Pair Loopback", the second is "Per Channel Loopback", and the third is "Loopback Disabled". Each row has four radio buttons, all of which are currently unselected.

Probe Card Loopback Control				
Channel Pair Loopback	☐	☐	☐	☐
Per Channel Loopback	☐	☐	☐	☐
Loopback Disabled	☐	☐	☐	☐

- **Channel Pair Loopback** - This is the most common configuration of the FCTracer module. In this mode, the channel pairs designated in silkscreen on the face plate work together as a transmit and receive pair. Channel pairs include (1, 2) and (3, 4). The data received on one channel is retransmitted out the other channel of that pair.

Channel Pair Loopback configuration allows you to place FCTracer between two nodes on a link such as between an HBA and a switch. You connect one device to one of FCTracer's paired channels and the other device to the other paired channel - for example, Channels 1 and 2. The internal loopback between the channel pairs of FCTracer ensure that these devices communicate as if the analyzer was not present.

- **Single Channel Loopback** - In this mode, each channel has a loopback of the RX signal back to the TX output of the same channel. This configuration can be used to monitor traffic coming from a single Fibre Channel device. The device being probed will receive back the exact traffic that it has transmitted.
This mode can also be used to probe traffic on an arbitrated loop. By plugging one channel of the FCTracer into one channel of a Fibre Channel hub, the analyzer can monitor traffic on that hub. In this mode,

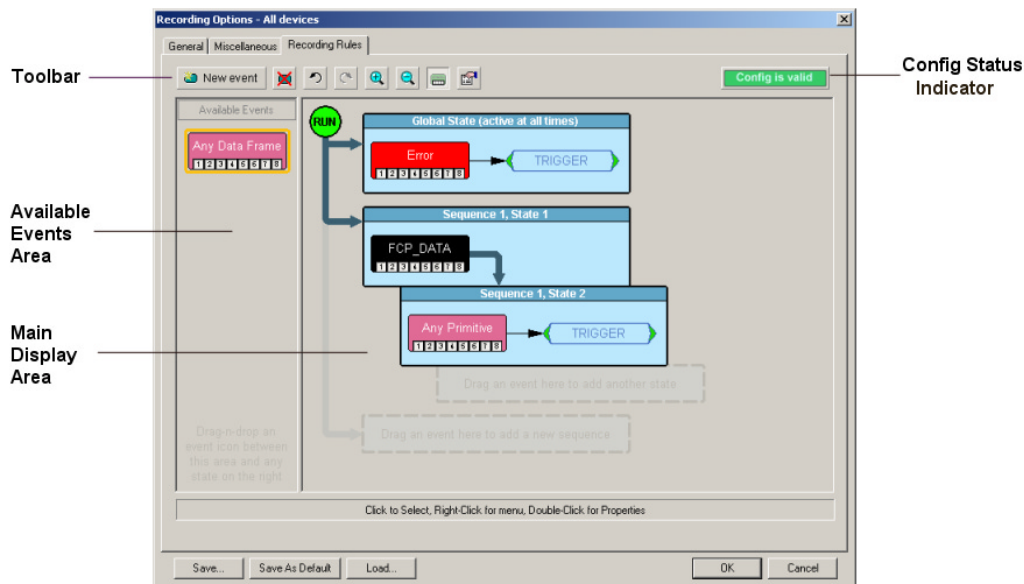
the FCTracer is physically part of the FC-AL loop, but does not participate as a node.

- **Loopback Disabled** - In this mode, the FCTracer can record traffic received on each channel, but the TX output of each channel is disabled. This mode is used to probe traffic on a Fibre Channel hub without being part of the FC-AL loop. To use this mode, connect one channel of FCTracer to one port of a Fibre Channel hub. FCTracer will be able to monitor traffic on the hub, but since no data comes from the FCTracer, the Hub will bypass that channel and the FC-AL loop will persist as if FCTracer is not connected to the Hub. This mode may be useful in rare scenarios where the timing or delays which exist in the FC-AL loop are effecting correct operation. FCTracer can be used in this scenario to monitor traffic without effecting the overall delay associated with the loop.

To perform loopback, FCTracer utilizes an analog port bypass circuit. The signal is not re-timed using PLL circuits, but is re-amplified by both the port bypass circuit and an SFP module.

5.8 Recording Options - Recording Rules

The Recording Rules page lets you set triggers and filters. The page divides into following areas:

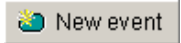


- **Toolbar** - Contains buttons that control the Recording Rules page.
- **Available Events area** -- Part of the screen where you can park buttons that you intend to use in the Main display area

- **Main display area** -- Part of the screen where you create trigger and filter conditions. You create conditions by dragging buttons onto the Main display area from the Available Events area. You then create additional conditions by right-clicking on a button and selecting options from a pop-up menu.
- **Config Status Indicator** (shown top right) - A button that tells you if your configuration is valid or invalid. When Events have been correctly configured, the button will turn green and display the text **Config is Valid**. When the configuration is incorrect, the button will turn red and display the text **Config is Invalid**.
- **Pop Up Menus** (not shown) - Right-clicking on button or area in the Recording Rules page will access a context-sensitive pop-up menu containing most of the commands listed in the toolbar.

5.9 Recording Rules Toolbar

The Recording Rules toolbar exposes functionality for controlling the Recording Rules page.

	New Event. Creates a new event in the Available Events area. A set of cascaded menus will pop up.
	Delete Event. Deletes selected event.
	Undo. Undoes last change made to Recording Rules page. The undo buffer has unlimited depth.
	Redo. Repeats changes undone by the Undo button.
	Zoom In. Enlarges the display. There are five zoom levels. The default level is the middle one. If you have a wheel mouse, you can also zoom by holding down the Control key and then operating the mouse wheel.
	Zoom Out. Makes the display appear smaller.
	Show/Hide channels. When pressed, this button tells the Recording Rules dialog to show the channel buttons on the Events icons. When unpressed, the channels are hidden.

	Show/Hide Properties Dialog. Shows or hides the Properties dialog of the selected State/Event/Action.
	Config is valid. This message display when the current Recording Rules configuration can be executed by the hardware. When the configuration is incorrect, the message is replaced by "Config is incorrect."
	Config is incorrect. This message displays when the current Recording Rules configuration exceeds hardware limitations. The message gets updated every time the Recording Rules configuration changes. You can click this indicator to get the diagnostics message box to find the problem.

5.10 Recording Rules Page - How it Works

The Recording Rules page can be thought of as a chalk board where you create a graphical model of the events and actions. In essence, you are creating a visual representation of the rules that the analyzer should follow during a recording when it encounters events that you specify.

You can create simple or complex rules.

Creating a rule involves four steps:

- Step 1** Create event buttons.
- Step 2** Click the small buttons on the Event buttons to select the channels that the analyzer should record.
- Step 3** Move the Event buttons to the Main Display area.
- Step 4** Assign an action such as Trigger to the events buttons.

Creating Event Buttons

To create a rule, you start by creating one or more Event buttons. When you create Event buttons they are automatically parked in the Available Events area. The following steps show the process.

- Step 1** Click the **New Event** button.
A menu of Events displays.
- Step 2** Select an Event from the menu. The selected Event will appear in the **Available Events** area.
- Step 3** To move the button to the main display area, drag the event button.



Selecting a Channel

At the bottom of each event button are eight small buttons that represent analyzer channels. Selecting a channel button tells the analyzer which channels it should watch. For example, if you depress all of the buttons except for the button marked "6," it means "search all channels except for channel 6."



Dragging a Button to the Main Display Area

When you drag an event button to the main display area, there are two places you can put the button: in a cell marked "Global State" and in another marked "Drag an event here to add an event sequence."

Global State - This cell is a placeholder for rules that are active throughout the recording. If you place an event button here such as Error and then assign an action such as Trigger, the analyzer will *always* look for Errors and trigger when an error is found.

Drag an event here to add an event sequence - This cell is used to create conditional rules called *Event Sequences*. An *Event Sequence* is a chain of events leading to some outcome such as triggering - such as "If *x* is followed by *y*, trigger."

These cells are explained in greater detail in "Using the Global State Cell" on page 89 and in "Using Sequence Cells" on page 93.

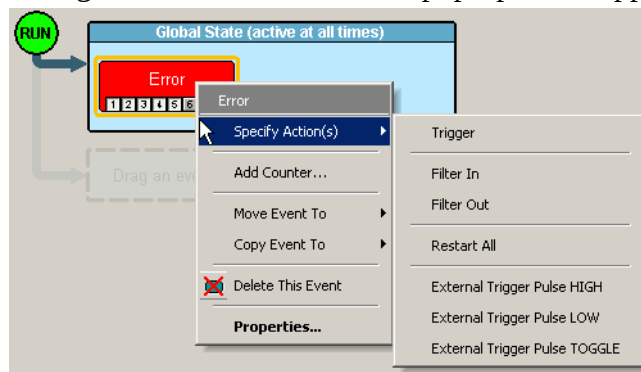
Assigning an Action

When an event button has been placed in one of the cells in the main display area, you are not done - you still need to assign an action to the button.

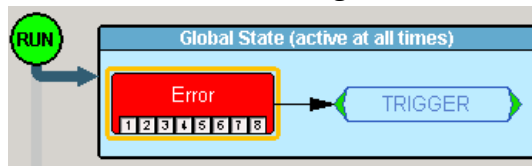
Note If you do not assign an action to an event button, the analyzer will ignore the selected event.

To assign an action to an event button,

Step 1 Right-click on the button. A pop-up menu appears:



- Step 2** Select **Specify Action** and then an action from the sub-menu. The menu closes and the action is assigned.



Note The menu is context-sensitive. If you right-click a button that is in the cell marked "Drag an event here to add a new sequence," you will get additional options.

Note You can also set actions within the Properties dialog for each event. Double-click on the Event button to open the Properties dialog, then select the Actions tab and set your actions.

5.11 Pop-up Menus

The pop-up menu are context-sensitive and will display different options depending on the object you have clicked.

State Pop-up

If you click on a State cell, you will get the following pop-up menu:

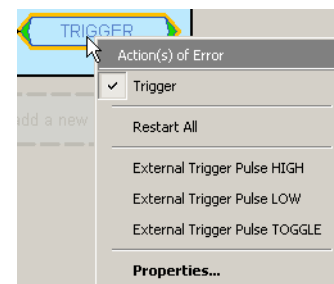


New Event - Brings up the same menu that you get when you click the New Event button on the toolbar.

Properties - Brings up the State Properties dialog for the selected state.

Action Pop-up Menu

If you click on an Action button, you will get the following pop-up menu:

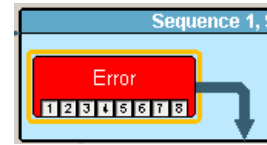


Trigger - Sets or clears Trigger action.

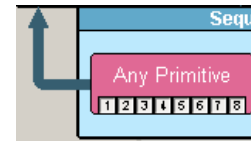
Filter In - Sets or clears Filter In action. This option precludes the use of Filter Out.

Filter Out - Sets or clears the Filter Out action. This option precludes the use of Filter In.

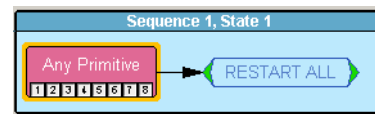
Advance the Sequence - Creates an event sequence consisting of the event you clicked on and some subsequent event. A thick arrow will appear from the selected event and point downward. If you place an event button below the arrow, the analyzer will look for the first event followed by the second event.



Restart the Sequence - Restarts the event sequence. This menu option is context-sensitive, and will only appear if you have created an event sequence. A thick arrow will appear from the selected event and point upward towards the preceding button.



Restart All - Restarts all rules in all sequences and in the global state. When you select this option, an arrow and Restart All button will appear. This action precludes selecting Advance the Sequence and Restart the Sequence.



External Trigger Pulse HIGH, Pulse LOW, Pulse TOGGLE - Causes the event send an external signal out through the External Out port on the back of the UPAS. The shape of the signal (Pulse HIGH, Pulse LOW or Pulse TOGGLE) must be the same for all events sending out such signal. This means that if you change the output signal for one event, it will automatically change the signal for all other events sending output signals.

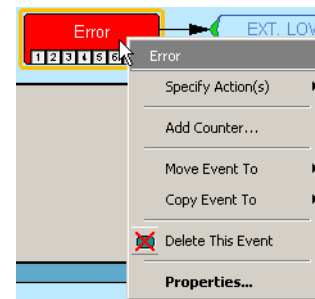
Properties - Displays the Action Properties dialog for the selected state.

Event Pop-up Menu

If you click on an Event button, you will get the following pop-up menu:

Specify Action(s) - opens a sub-menu with the following options:

- **Trigger** - Triggers end of recording. Recording continues until post-trigger buffer is expended. Buffer settings are controlled by the Recording Options - General page.
- **Filter Out** - Excludes selected traffic from recording. Filtering preserves recording memory, thereby extending recording sessions and excluding events of little interest.
- **Filter In** - Includes selected traffic in recording.
- **External Trigger Pulse HIGH** - Sends an output signal with a Pulse High format through the output ports on the back of the UPAS. Pulse



High is the default format. Pulse High causes the analyzer to transmit a 5 volt, 40 nanosecond signal.

- **External Trigger Pulse LOW** - Sends an output signal with a Pulse Low format through the output ports on the back of the UPAS. Pulse Low causes the analyzer to transmit a 0 volt, 40 nanosecond signal.
- **External Trigger Pulse TOGGLE** - This format causes the analyzer to transmit a signal that will toggle with each trigger event between a continuous 5 volt signal and a continuous 0 volt signal.

Add Counter - Displays the Event Properties dialog with the Counter selected and ready to accept the count value. The menu item is not shown if the counter is not applicable to the selected event. If the counter is already specified this menu item is replaced with **Don't Use Counter** and **Change Counter Value**.

Move Event To - Moves selected event to a different position in the Recording Rules window.

Copy Event To - Copies selected event to a different position in the Recording Rules window.

Delete this Event - Deletes the selected Event. Alternatively, you can use the Delete button on the toolbar or keyboard to delete events.

Properties - Opens a dialog box and lets you specify further sub-types (for example, types of errors) and additional conditions for the selected event.

5.12 Events

To see the list of selectable events, click the New Events button.

The following table shows the types of Events available for selection:

Category	Event	Parameters to Set
FC Bus Event	Data Pattern	Specify Mask-Match pattern for any part of the Frame
	Primitive	Select one or more of the 15 FC Primitives
	Advanced Primitive	Specify parameters for any one of the 15 FC Primitives
	Error	Select 1 or more of 10 error types
	Any Data Frame	
	EOF	
	Any Data Frame	
	Any Primitive	
	Connect	
	Disconnect	
FC Loop Initialization	LISM	
	LIFA	
	LIPA	
	LIHA	
	LISA	
	LIRP	
	LILP	
FC Basic Link Services	NOP	
	ABTS	
	RMC	
	BA_ACC	
	BA_RJT	
	PRMT	

Category	Event	Parameters to Set
SCSI Operations	XFER_RDY	Specify XFER_RDY params
	DATA	Specify up to 8 Dwords of FCP Data
	RSP	Specify RSP parameters
	CONF	
	Extended CDBs	Listed under "FCP_CMND" below
	SCSI Primary Command set (SPC-3)	Listed under "FCP_CMND" below
	SCSI Block Command set (SBC-2)	Listed under "FCP_CMND" below
	SCSI Media Changer Command set (SMC-2)	Listed under "FCP_CMND" below

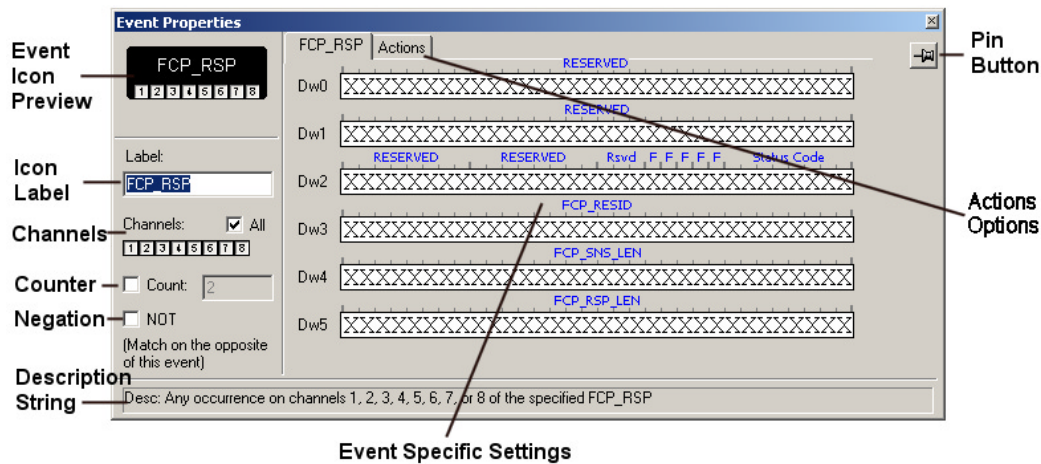
	FCP_CMND:	
	0x00 TEST UNIT READY	0x50 XDWRITE(10)
	0x01 REWIND	0x51 XPWRITE(10)
	0x03 REQUEST SENSE	0x52 XDREAD(10)
	0x04 FORMAT UNIT	0x53 XDWRITEREAD(10)
	0x05 READ BLOCK LIMITS	0x55 MODE SELECT(10)
	0x07 REASSIGN BLOCKS	0x56 RESERVE(10)
	0x08 READ(6)	0x57 RELEASE(10)
	0x0A SEND	0x5A MODE SENSE(10)
	0x0B SET CAPACITY	0x5E PERSISTENT RESERVE IN
	0x0F READ REVERSE(6)	0x5F PERSISTENT RESERVE OUT
	0x11 SPACE(6)	0x7F EXTENDED CDB
	0x12 INQUIRY	0x80 XDWRITE EXTENDED(16)
	0x14 RCVR BUFFERED DATA	0x81 REBUILD(16)
	0x15 MODE SELECT(6)	0x82 REGENERATE(16)
	0x16 RESERVE(6)	0x83 EXTENDED COPY
	0x17 RELEASE(6)	0x84 RECEIVE COPY RESULTS
	0x1A MODE SENSE(6)	0x88 READ(16)
	0x1B START STOP UNIT	0x8A WRITE(16)
	0x1C RECEIVE DIAG RESULTS	0x8C READ ATTRIBUTE
	0x1D SEND DIAGNOSTIC	0x8D WRITE ATTRIBUTE
	0x1E PREVENT ALLW MDM RMVL	0x8E WRITE AND VERIFY(16)
	0x25 READ CAPACITY(10)	0x8F VERIFY(16)
	0x28 READ(10)	0x90 PRE-FETCH(16)
	0x29 READ GENERATION	0x91 SYNC CACHE(16)
	0x2A WRITE(10)	0x92 LOCK-UNLCK CACHE(16)
	0x2B SEEK(10)	0x93 WRITE SAME(16)
	0x2C ERASE(10)	0x9E READ CAPACITY(16)
	0x2D READ UPDATED BLOCK	0xA0 REPORT LUNS
	0x2E WRITE AND VERIFY(10)	0xA3 REPORT DEVICE ID
	0x2F VERIFY(10)	0xA4 SET DEVICE IDENTIFIER
	0x33 SET LIMITS(10)	0xA5 MOVE MEDIUM
	0x34 PRE-FETCH(10)	0xA6 EXCHANGE MEDIUM
	0x35 SYNC CACHE(10)	0xA7 MOVE MEDIUM ATTACHED
	0x36 LOCK-UNLCK CACHE(10)	0xA8 READ(12)
	0x37 READ DEFECT DATA(10)	0xAA WRITE(12)
	0x38 MEDIUM SCAN	0xAC ERASE(12)
	0x3B WRITE BUFFER	0xAE WRITE AND VERIFY(12)
	0x3C READ BUFFER	0xAF VERIFY(12)
	0x3D UPDATE BLOCK	0xB3 SET LIMITS(12)
	0x3E READ LONG	0xB4 READ ELMNT STS ATTCH
	0x3F WRITE LONG	0xB5 REQST VOL ELMNT ADDR
	0x41 WRITE SAME(10)	0xB6 SEND VOLUME TAG
	0x44 REPORT DNSTY SUPRT	0xB7 READ DEFECT DATA(12)
	0x4C LOG SELECT	0xB8 READ ELEMENT STATUS
	0x4D LOG SENSE	

5.13 Properties Dialogs

Double-clicking on a Event, Action, or State button will cause a Properties dialog box to appear. The Properties dialog displays options for setting additional conditions for a selected Event, Action or State.

Event Properties Dialog

The Event Properties dialog is invoked by double-clicking an event, right-clicking an event and selecting Properties from the pop-up menu, or clicking on the Properties button on the toolbar.



Event Icon Preview - This icon shows you which event properties you are editing. The Icon Preview looks exactly like the icon in the Main Display area.

Icon Label - A text box for labeling the button. Whatever you type here will appear on the button.

Channels - These controls allow you to select the channel(s) that the analyzer should search when it is looking for the event.

Counter - A counter tells the analyzer to search for x instances of the selected event. For example, if you enter "10," the analyzer will count 10 instances of the selected event before it performs whatever action you assign. There are only two counts available in the hardware so if you try to assign more than two, you will get a warning.

Note Counters can not be applied to events with Filter Actions. The maximum counter value is 65,535.

Negation - Tells the hardware to match the opposite of the event. For example, if you select NOT for Errors Event, the match will occur on Error types that are not checked. If you select NOT for a SCSI command, the match will occur on any FCP_CMND except for the selected one, and also on the selected one if the additional parameters do not match.

Pin Button - Allows you to "pin" the Properties dialog box to the application so that it does not go away when another object appears such as an event, state or action.

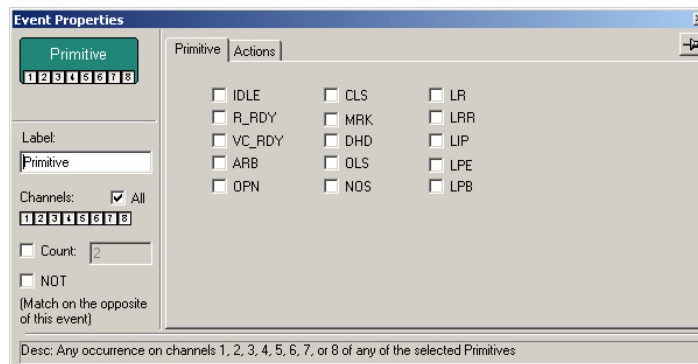
Description String - This area contains a textual description of the event.

Event-specific Settings - The largest part of the Event Properties dialog box. Selecting an option narrows the range of events that the analyzer will search for.

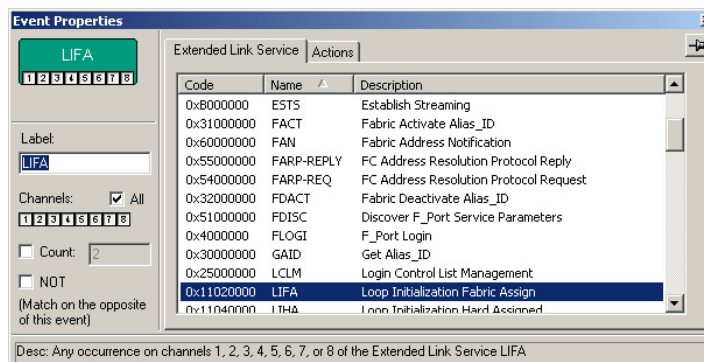
The settings in this area vary depending on the selected events. There are three basic formats:

- **Checkboxes**
- **List**
- **Pattern Editor**

Checkboxes and **Lists** (shown below) present lists of options. Selecting one or more options tells the analyzer what event(s) to look for.



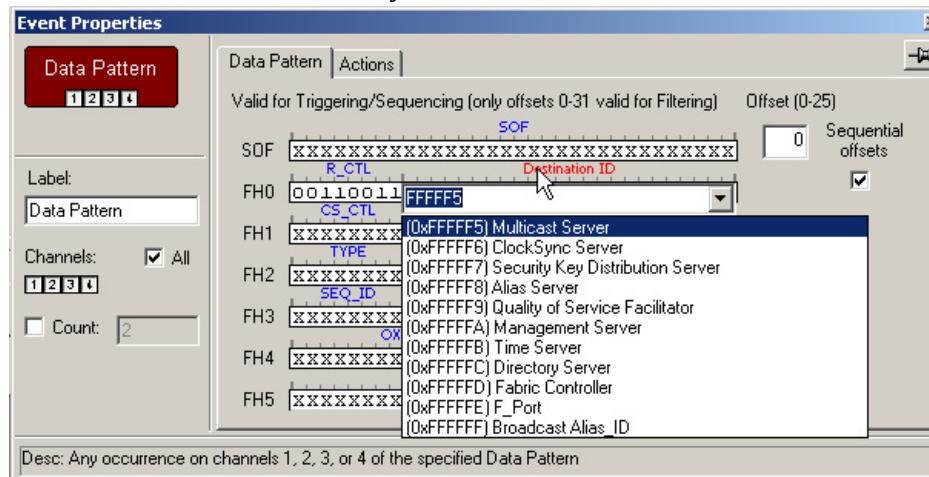
A properties dialog box showing checkbox options.



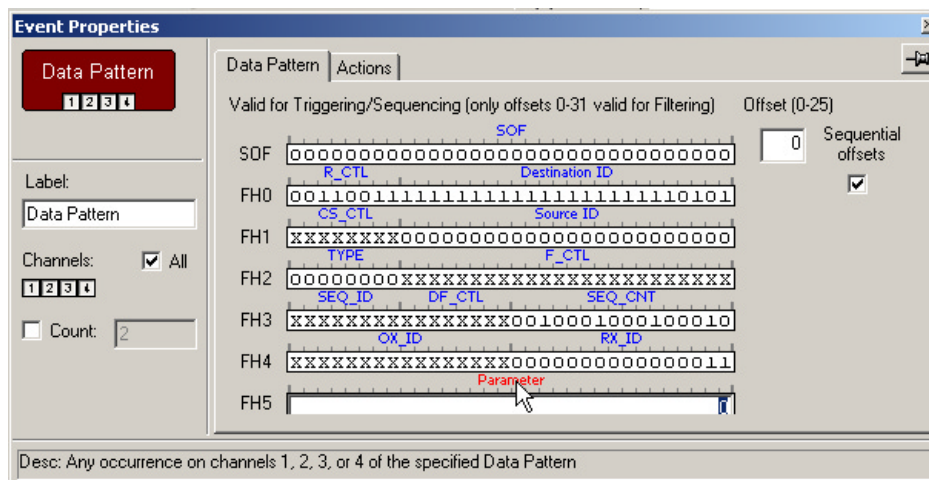
A properties dialog showing list options.

The **Pattern Editor** presents text boxes in which Mask-Match values can be entered for any of the data fields. The "XXX" value means that the particular bit is being ignored by the hardware when trying to match a data pattern.

Some text boxes contain blue field headings that indicate the presence of menus or hex-to-binary converters. If a menu is contained, clicking the blue heading will open it as shown below. If a hex converter is contained, a box will open. Typing a hex value into the box and then hitting <return> will convert the hex value to binary.

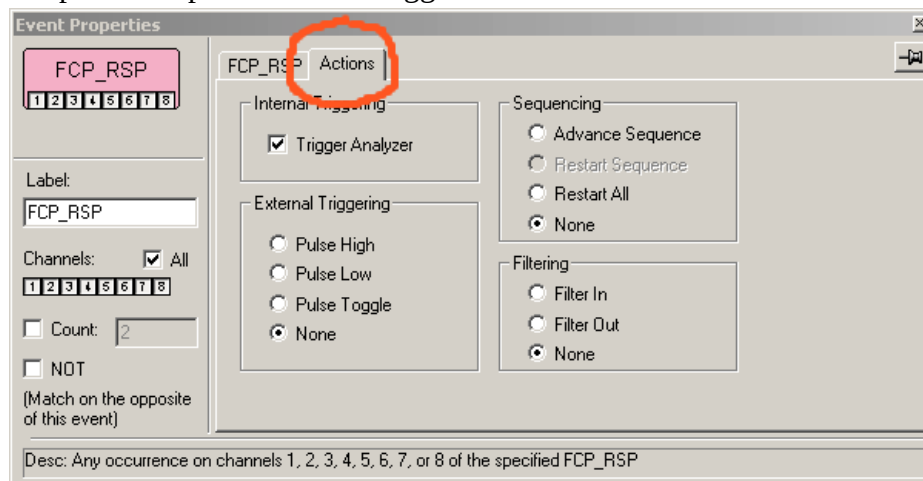


Properties dialog showing a drop-down menu.



Properties dialog showing a hex-to-binary converter.

Actions Tab - At the top of each properties dialog is a tab marked **Actions** that presents options such as triggers to be set.



5.14 Event Properties Dialog Boxes - Descriptions

Each Event button has a different Properties dialog box. And each Properties dialog box has a different set of options.

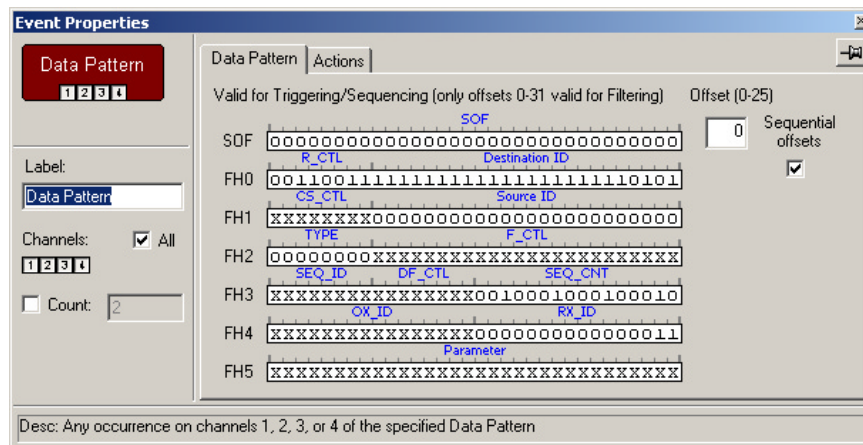
This section describes the Event Properties dialog boxes and their options. The dialogs will be described in the order that they appear in the New Events menu:

- FC Bus Event
- FC Loop Initialization
- FC Basic Link Services
- FC Extended Link Services
- SCSI Operations

FC BUS EVENT

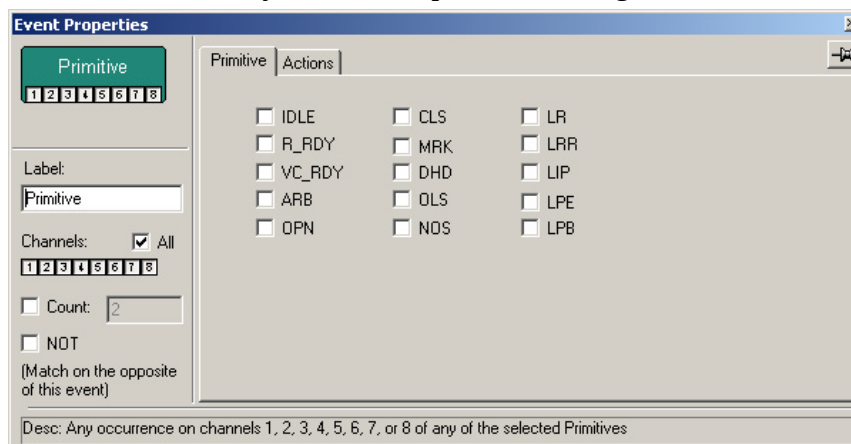
Data Pattern Properties Dialog

Presents options for triggering or filtering on user-defined data patterns. Clicking a blue heading will open a box with either a menu or a hex-to-binary converter. If NOT is checked, any unchecked data pattern will generate an event match.



Primitive Properties Dialog

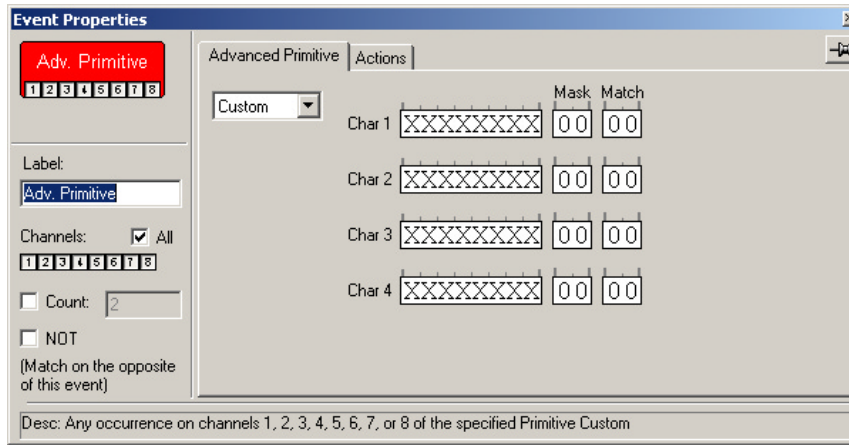
Presents options for triggering or filtering on various Primitive types. If NOT is checked, any unchecked primitive will generate an event match.



Advanced Primitive Properties Dialog

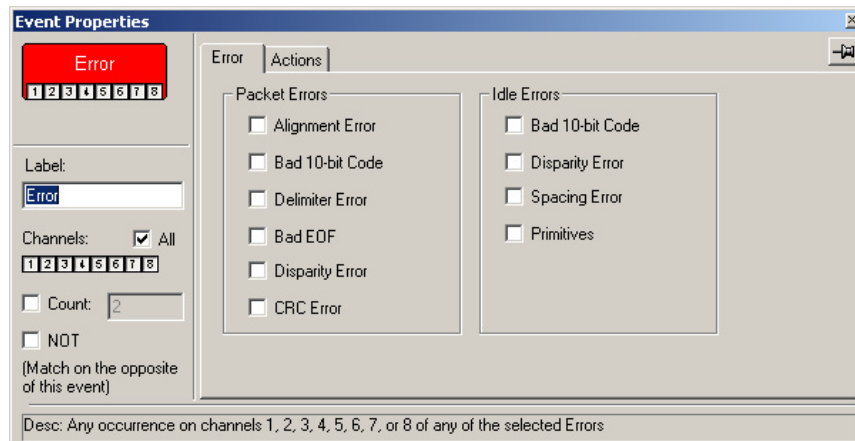
Presents options for selecting a Primitive type and additional data using a Mask-Match byte text box. Enter the values, then press enter. Note that the icon's color changes according to the selected primitive. The primitive colors are specified only in Display Options. If NOT is specified an event

match will be generated in one of two cases: (a) when a primitive other than selected occurs, and (b) when selected primitive occurs that doesn't satisfy the specified Mask-Match condition.



Error Properties Dialog

The Error Properties dialog box lets specific error types to be selected for performing an action such as triggering.



Packet Errors

Alignment - An error in the 32-bit data alignment.

Symbol - An Error in symbol integrity. A symbol integrity error can happen if any of 10-bit symbol is received is not one of the legal 10-bit encoding for the type of data expected.

Delimiter - A sequence error in the frame delimiters SOF and EOF. If two SOF delimiters or two EOF delimiters are received in a row, this error will be flagged.

EOF - An EOF Invalid or EOF Abort Delimiter has been received indicating receipt of an invalid frame.

Disparity - A running disparity error.

CRC - A CRC error.

Idle Errors

Symbol - An Error in symbol integrity. A symbol integrity error can happen if any of 10-bit symbol is received is not one of the legal 10-bit encoding for the type of data expected.

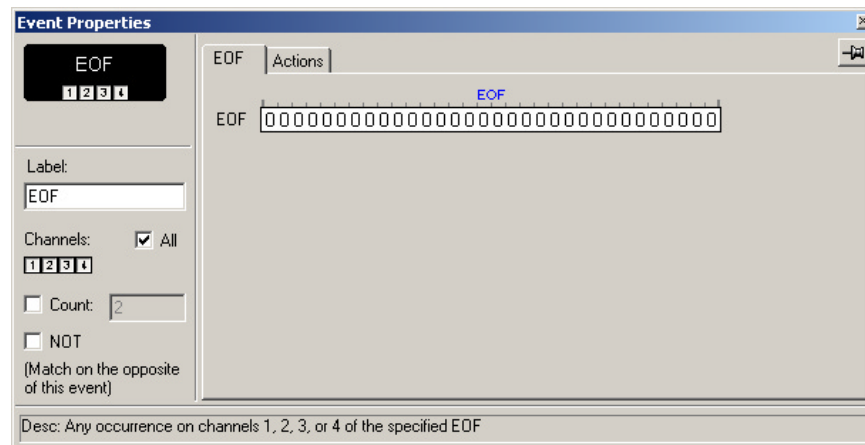
Disparity - A running disparity error in the idle codes.

Spacing - A spacing error in which fewer than two primitives are received between frames. These primitives are necessary to allow for compensation of transmitter and receiver clock frequencies.

Primitives - A Primitive Sequence error in which a Primitive Sequence is received with fewer than three consecutive instances of that ordered set.

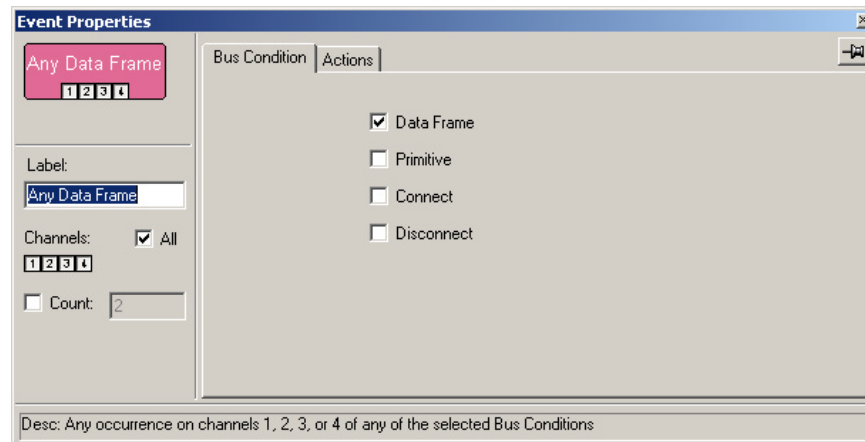
EOF Properties Dialog

Presents options for triggering or filtering on various End of Frame types. Click the blue heading to open a menu of EOF types. If NOT is checked, any unchecked primitive will generate an event match.



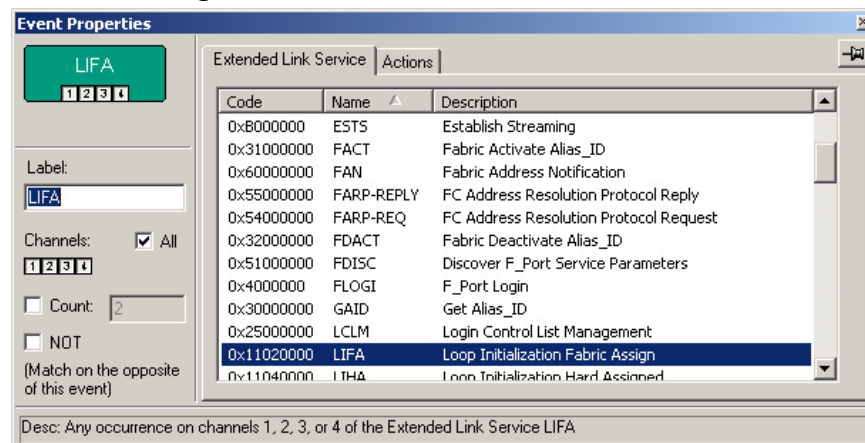
Properties Dialogs - Any Data Frame, Primitive, Connect, Disconnect

The Properties dialogs for **Any Data Frame**, **Primitive**, **Connect**, and **Disconnect** are all the same dialog but have the relevant option selected. If **NOT** is checked, any unchecked event will generate an event match.



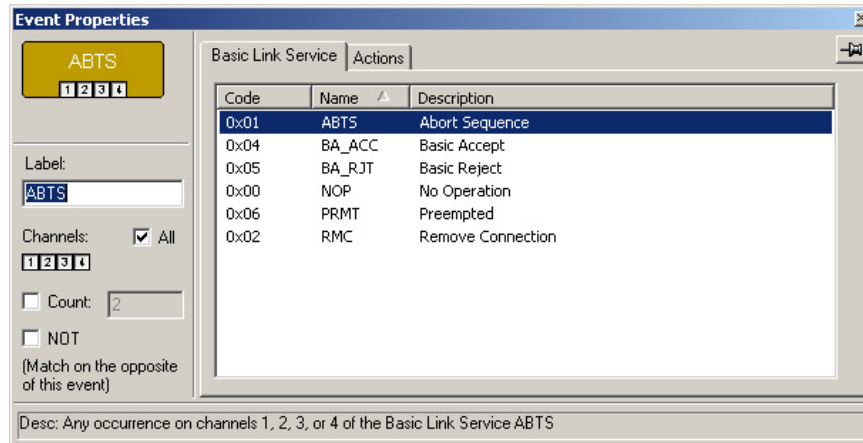
FC LOOP INITIALIZATION

FC Loop Initialization commands are displayed in a single properties dialog box shown below. Commands are presented in a menu. If **NOT** is checked, any unchecked event will generate an event match.



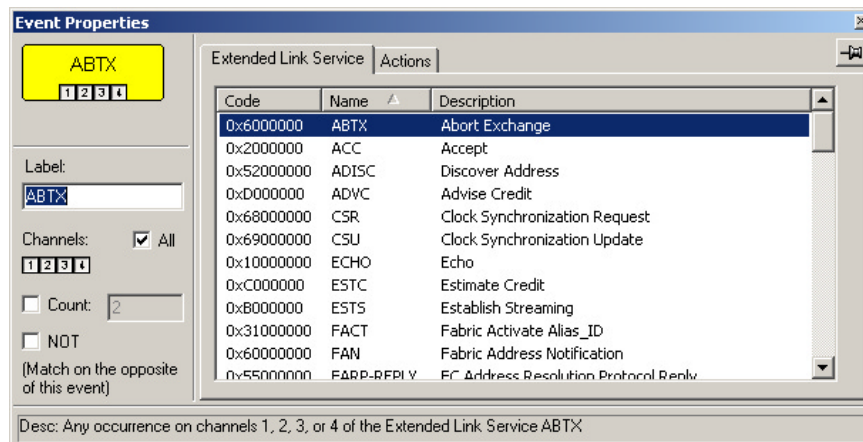
FC BASIC LINK SERVICES

Double-clicking on any of the **FC Basic Link Services** event buttons will display a single properties dialog box shown below. Commands are presented in a menu. If NOT is checked, any unchecked event will generate an event match.



FC EXTENDED LINK SERVICES

Double-clicking on any of the **FC Extended Link Services** event buttons will display a single properties dialog box shown below. Commands are presented in a menu. If NOT is checked, any unchecked event will generate an event match.

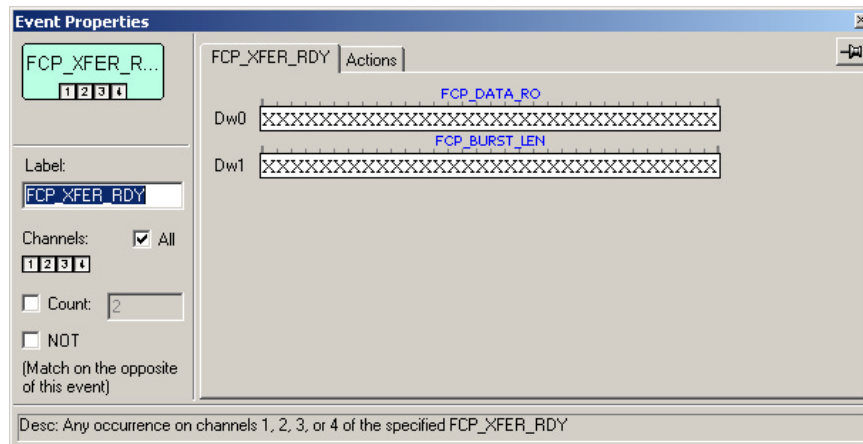


SCSI OPERATIONS

XFR_RDY

The XFR_RDY properties dialog box presents two pattern editor boxes that can be edited directly or indirectly via a hex-to-binary converter. To open the converter, click the blue headings and enter a hex value. The converter will translate the hex to binary.

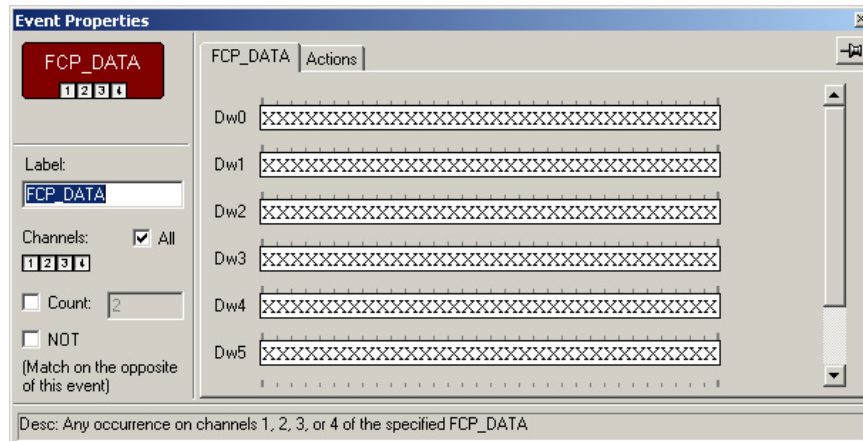
If NOT is checked, any unchecked event will generate an event match.



Data

The FCP_Data properties dialog box presents pattern editor boxes that accept binary values. Entering a value tells the analyzer to match the specified pattern.

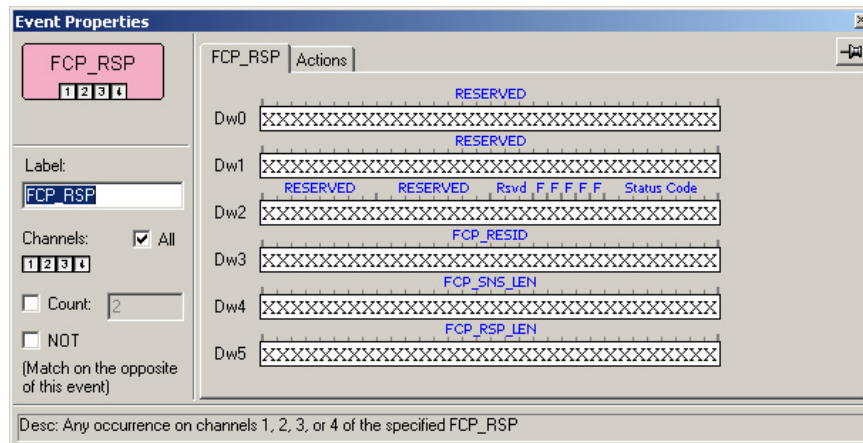
If NOT is checked, any unchecked event will generate an event match.



FCP

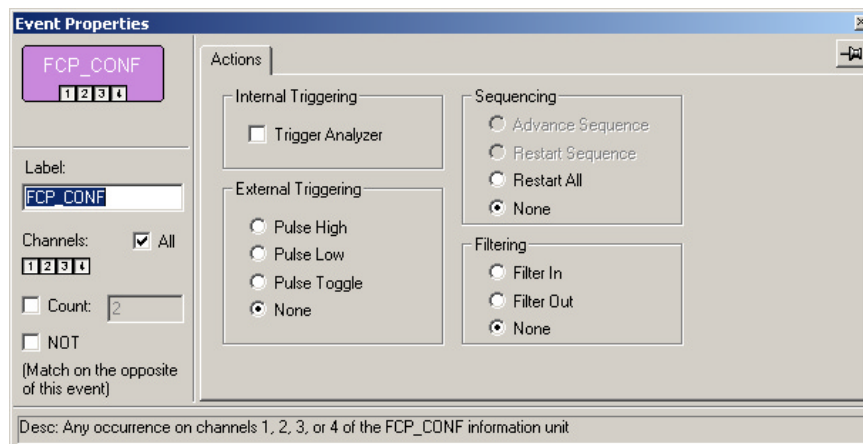
The XFR_RDY properties dialog box presents pattern editor boxes that can be edited directly or indirectly via a hex-to-binary converter. Entering a value tells the analyzer to match the specified pattern. To open the converter, click the blue headings and enter a hex value. The converter will translate the hex to binary.

If NOT is checked, any unchecked event will generate an event match.



Conf

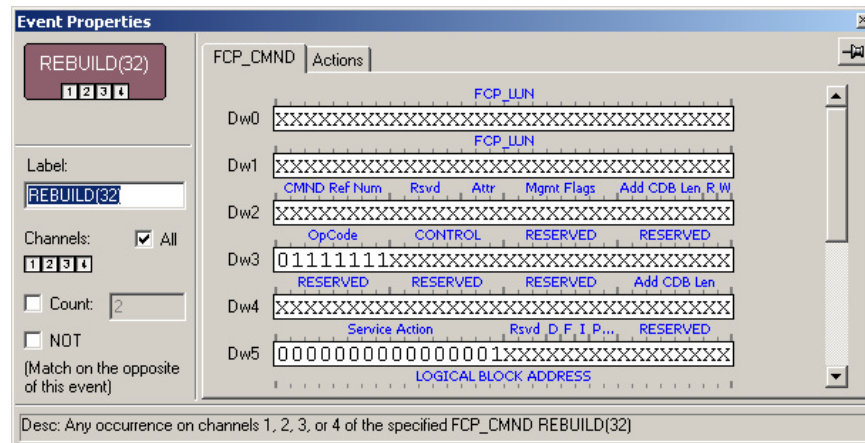
The **FCP_CONF** event properties dialog presents options for setting actions.



Extended CDBs

The properties dialogs for all of the **Extended CDBs** events present binary pattern editors for entering patterns. These editors also have a hex-to-binary converter which can be accessed by clicking the blue headings.

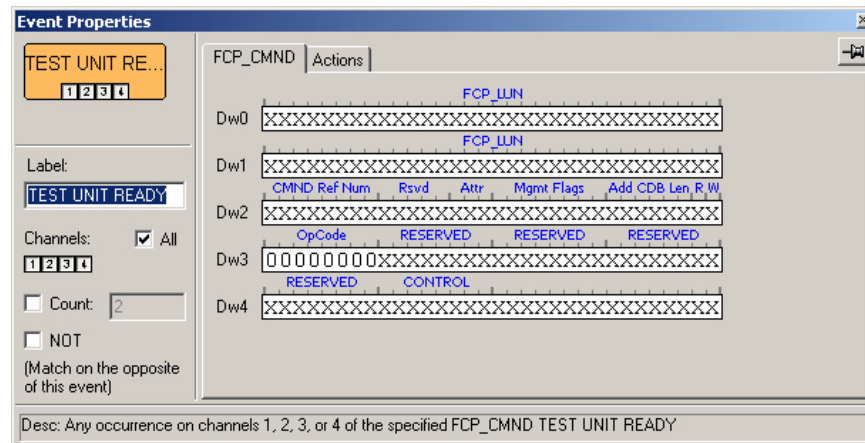
If NOT is checked, any unchecked event will generate an event match.



SCSI Primary Command Set (SPC-3)

The properties dialogs for the **SCSI Primary Command Set (SPC-3)** events present binary pattern editors for entering patterns. These editors also have a hex-to-binary converter which can be accessed by clicking the blue headings.

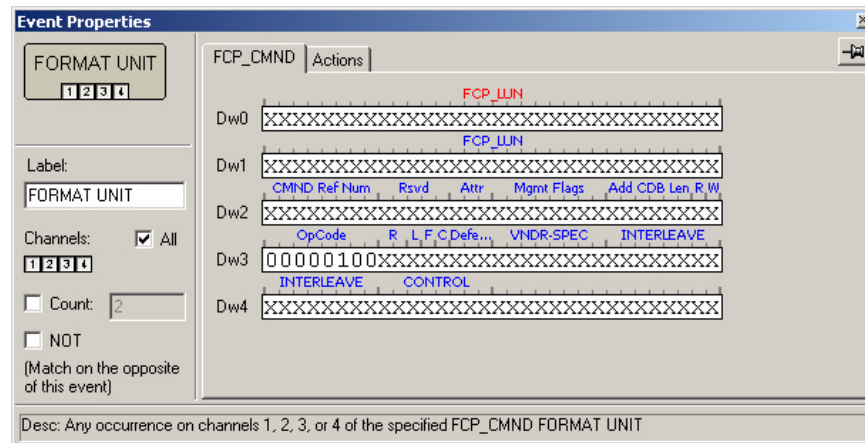
If NOT is checked, any unchecked event will generate an event match.



SCSI Block Command Set (SBC-2)

The properties dialogs for the **SCSI Block Command Set (SBC-2)** events present binary pattern editors for entering patterns. These editors also have a hex-to-binary converter which can be accessed by clicking the blue headings.

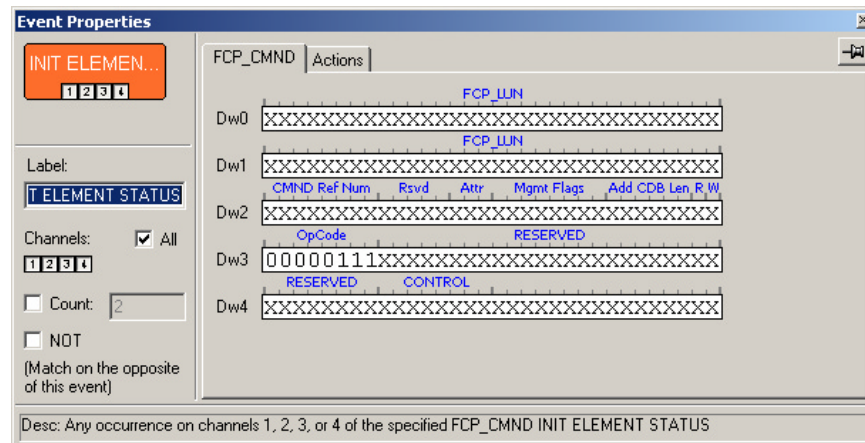
If NOT is checked, any unchecked event will generate an event match.



SCSI Media Changer Command set (SMC-2)

The properties dialogs for the **SCSI Media Changer Command set (SMC-2)** events present binary pattern editors for entering patterns. These editors also have a hex-to-binary converter which can be accessed by clicking the blue headings.

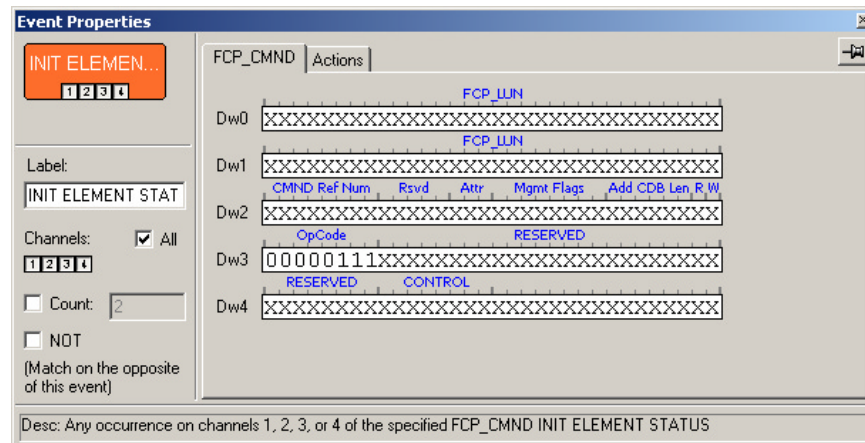
If NOT is checked, any unchecked event will generate an event match.



SCSI Stream Command set (SSC-2)

The properties dialogs for the **SCSI Stream Command set (SSC-2)** events present binary pattern editors for entering patterns. These editors also have a hex-to-binary converter which can be accessed by clicking the blue headings.

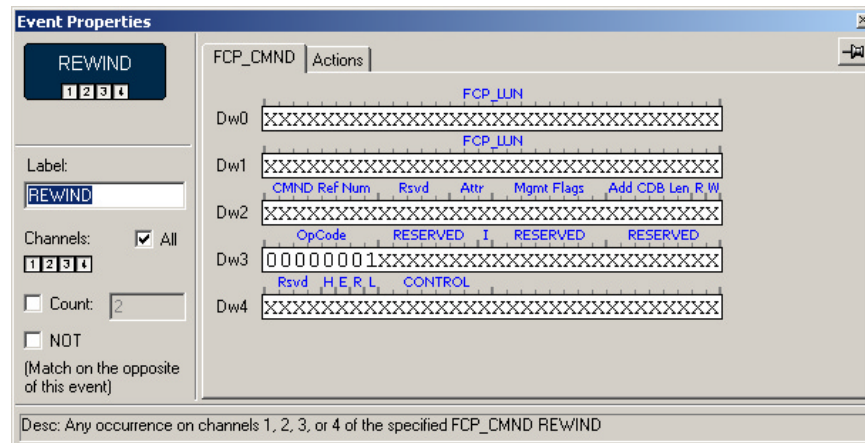
If NOT is checked, any unchecked event will generate an event match.



SCSI Stream Command set (SSC-2)

The properties dialogs for the **SCSI Stream Command set (SSC-2)** (**SMC-2**) events present binary pattern editors for entering patterns. These editors also have a hex-to-binary converter which can be accessed by clicking the blue headings.

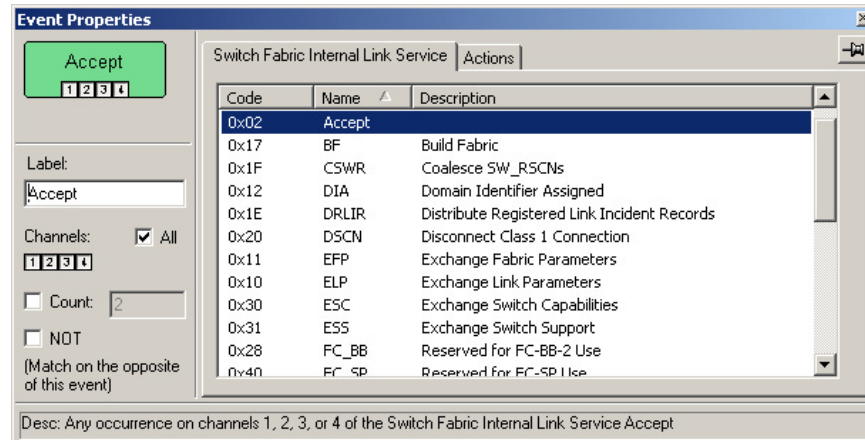
If NOT is checked, any unchecked event will generate an event match.



SWITCH FABRIC INTERNAL LINK SERVICES

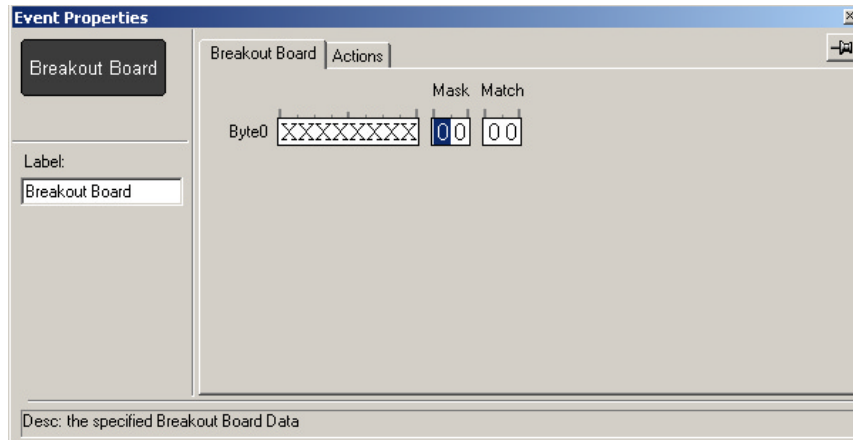
The properties dialogs for all of the **Switch Fabric Internal Link Services** are all one and the same - a dialog with a menu for the various Link Services.

If NOT is checked, any unchecked event will generate an event match.



BREAKOUT BOARD PROPERTIES DIALOG

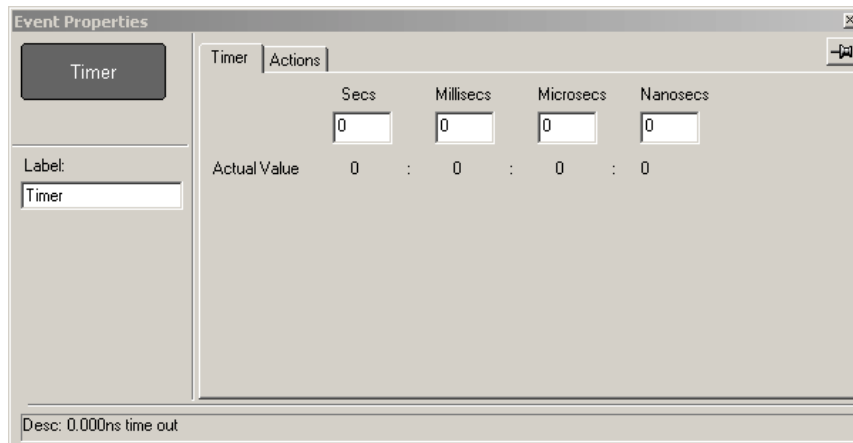
The Breakout Board properties dialog allows a Mask-Match pattern to be specified for the Breakout Board. The pattern tells the analyzer what external input signal to look for. The NOT checkbox is not available for the Breakout Board event.



TIMER PROPERTIES DIALOG

The Timer properties dialog allows the value for a timer to be set. Setting a timer tells the analyzer to wait for the specified time until performing an action. For example, you could set the analyzer to wait 1 second after an error before triggering.

The Timer properties dialog allows the time interval to be set. Time units are seconds, milliseconds, microseconds, and nanoseconds. The actual timer value is shown below the edit controls and reflects the hardware precision capabilities. The time is rounded up to the next 7.519 nanosecond sample, which corresponds to the 1.33 MHz internal clock frequency.



5.15 Assigning Actions

As described above, you assign an action by right-clicking on an Event button and then selecting a command from the ensuing pop-up menu. The selected action will be represented by a button to the right of the Event button.

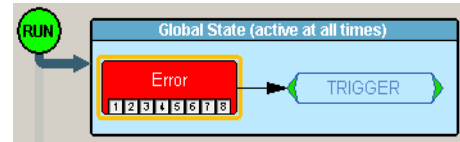


The following table shows the types of Actions you can select.

Category	Action	Comment
Trigger Actions	TRIGGER	
Filter Actions	FILTER OUT	Can't be assigned to the events with Counters. Can't be used for Timers.
	FILTER IN	
Control Actions	ADVANCE SEQUENCE (shown as a fat arrow)	Can't be used for the events in Global State. When sequence is advanced all rules in the old state getting disabled and all rules in the new state are getting initialized (timers restarted, counters recharged etc.)
	RESTART SEQUENCE (shown as a fat arrow)	Can't be used for the events in Global State or for the events in the first state of a sequence. When sequence is restarted all rules in the old state getting disabled and all rules in the first state are getting initialized (timers restarted, counters recharged etc.)
	RESTART ALL	When Recording Rules are restarted all rules in all sequences getting reinitialized (timers restarted, counters recharged etc.). All sequences start from the first state.
External Triggering	EXT. PULSE HIGH	All External Triggering Events have to be of the same type.
	EXT. PULSE LOW	
	EXT. PULSE TOGGLE	

5.16 Using the Global State Cell

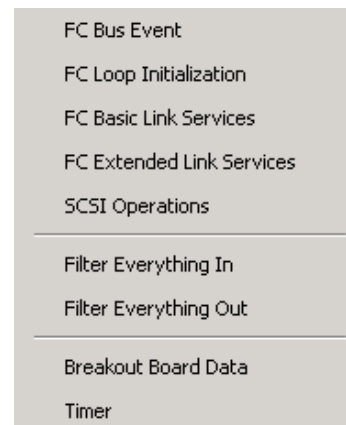
The Global State cell is used to create conditions that are active at all times. You can think of these conditions as the *default conditions*. The Global State cell is used to create simple event triggers and filters such as "Trigger when an xxx error occurs," or "filter out all xyz primitives.") For most simple trigger conditions, this is the appropriate cell to use.



Example - Creating a Simple Event Trigger

To create a simple condition that is active at all times, place an event button in the **Global State** cell:

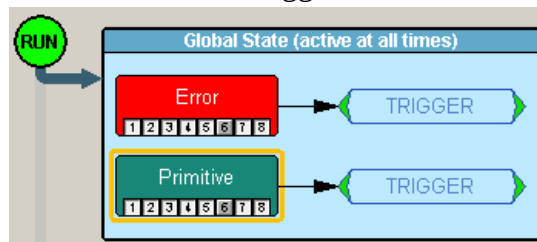
- Step 1** Click the New Event button. An Events menu opens (shown right).
- Step 2** Select an event from the menu. The event will appear as a button in the **Available Events** area on the left.
- Step 3** Drag the event button to the cell marked "Global State."
- Step 4** Right-click on the button (i.e., not the cell). A pop-up menu appears.
- Step 5** Select **Trigger** from the menu. An arrow will project from the error button and point to a cell marked **Trigger**.



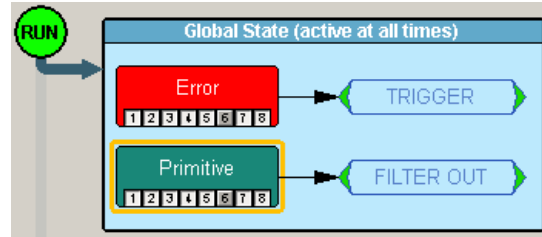
Creating Multiple Event Conditions in the Global State Cell

When multiple buttons are placed in the Global Cell, it creates an "AND" condition or an "OR" condition depending on the actions selected.

Creating an OR Condition - When two or more buttons in the Global State cell are assigned the *same* action, the analyzer will search for all of the events and perform the action on which ever event it sees first. The example below illustrates. It reads "Trigger if an error or a primitive occurs".

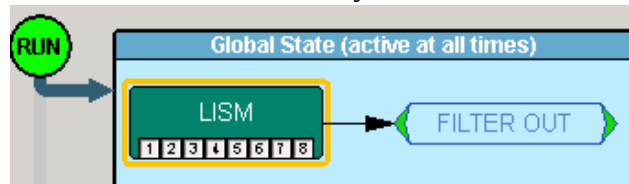


Creating an AND Condition - When multiple events are placed in the Global State cell and assigned *different* actions, an AND statement is created. The example below reads "Trigger if an error occurs AND filter out any primitives that occur."



Filter In and Filter Out

A filter causes the analyzer to filter in or out specified events from the recording. If events are filtered out of the recording, they are excluded and not simply hidden from the trace. The purpose of filtering is to preserve recording memory so you can conduct longer recording sessions and exclude events that do not interest you.



To Filter In or Out traffic,

Step 1 Click the **New Event** button. The **New Event** menu opens.

Step 2 Select an event from the menu.

Step 3 Drag the event into the Global State cell.

Note You could also drag it into the cell marked "Drag an event here to add a sequence."

Step 4 Right-click on the button. A pop-up menu opens.

Step 5 Select **Specify Action(s)**

Step 6 Select Filter Out (for example).

The analyzer is now configured to filter out the selected event.

Filter In or Out Everything

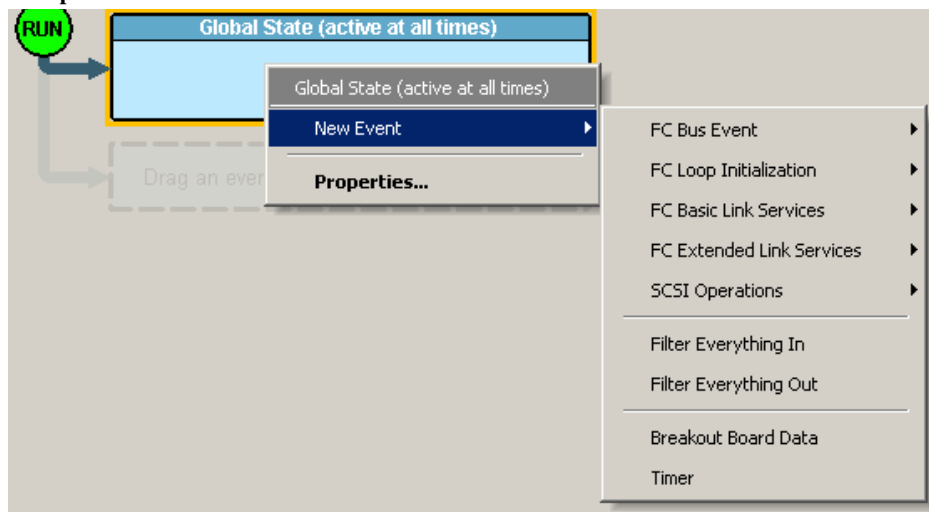
The options **Filter Out Everything** or **Filter In Everything** allow you to filter all traffic in or out of the trace. These options are useful in excluding all traffic from a recording until a key event occurs. For example, "Filter out

everything until you see an error. When an error occurs, filter in everything and trigger." Such a condition would result in a trace with no pre-trigger traffic.

To create a condition with **Filter In/Out Everything**, follow these steps:

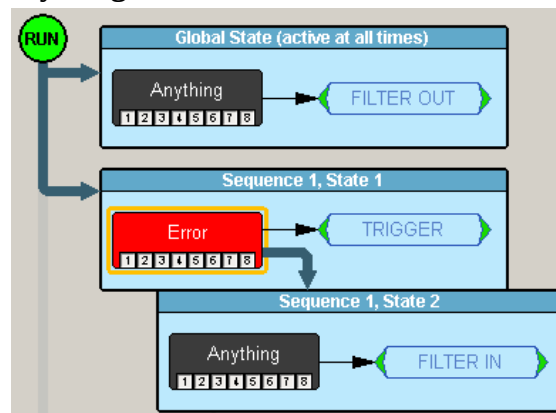
Step 1 Right-click in either an empty cell or the cell holding a button. Do not click on a button itself. In the example below, the **Global State** cell has been clicked.

Step 2 Select **New Event**.



Step 3 Select **Filter Everything Out**.

Step 4 The foregoing steps outline the process of creating a **Filter Out Everything** condition. Below is a more meaningful example:



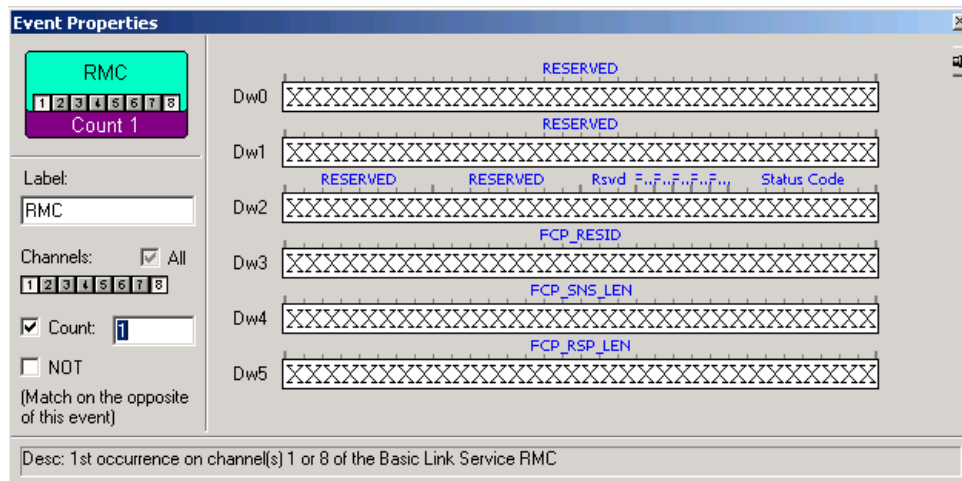
This example reads "Filter out all traffic until you see an error. When you see an error, trigger and filter in all traffic." This example will cause the analyzer to record traffic only from the trigger event onward. See "Creating Event Sequences" on page 93 for further details on creating multiple-event conditions like the one above.

Counting Events

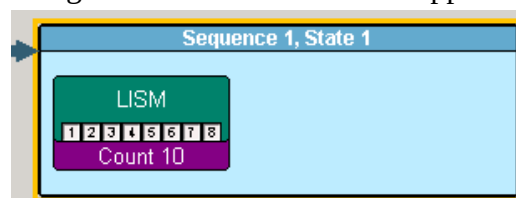
In addition to setting triggers and filters, you can also set *counters*. A counter is an action that allows you to set a trigger based on a count of events. For example, you could use a counter to "Trigger following the 16th occurrence of an error."

To use a counter, follow these steps:

- Step 1** Using the steps outlined above, select an event from the **Select Event** menu and drag it to the Main Display area in the center of the dialog box.
- Step 2** Click the small buttons 1-8 on the selected Event button to select the channels for the actions.
- Step 3** Right-click the event and select **Add Counter**. A dialog box opens.

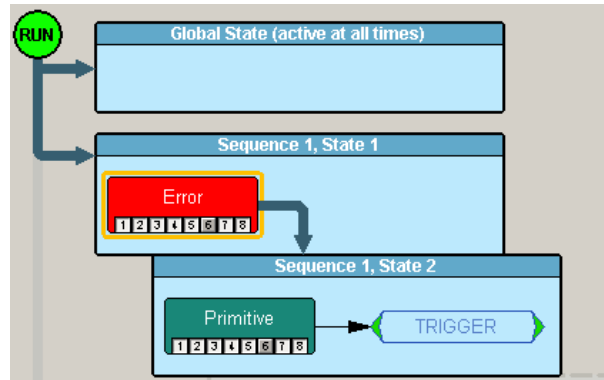


- Step 4** In the text box to the right of the label Count enter a value.
- Step 5** Make sure the checkbox to the left of the word Count is checked.
- Step 6** Click the X in the top right corner of the dialog box to close the dialog. A counter button should appear below your selected event.



5.17 Creating Event Sequences

Event sequences are chains of events leading to some action. A sequence is



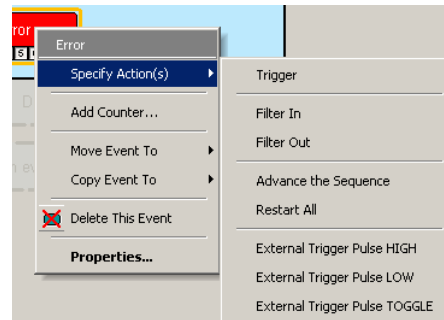
a multi-event "if, then" condition: "If x followed by y followed by z occurs, trigger." Event sequences are created by dragging two or more buttons to a cell marked *Drag an event here to add a new sequence*.

Note You cannot create an event sequence in the Global State cell.

Using Sequence Cells

Below the Global State cell is a faintly marked cell labeled "*Drag an event here to add a new sequence*." This is a *Sequence Cell*. Sequence cells allow you to create event sequences.

Sequence cells support the command *Advance the Sequence* (shown right). This option allows you to link events into sequences.



To see the *Advance the Sequence* command,

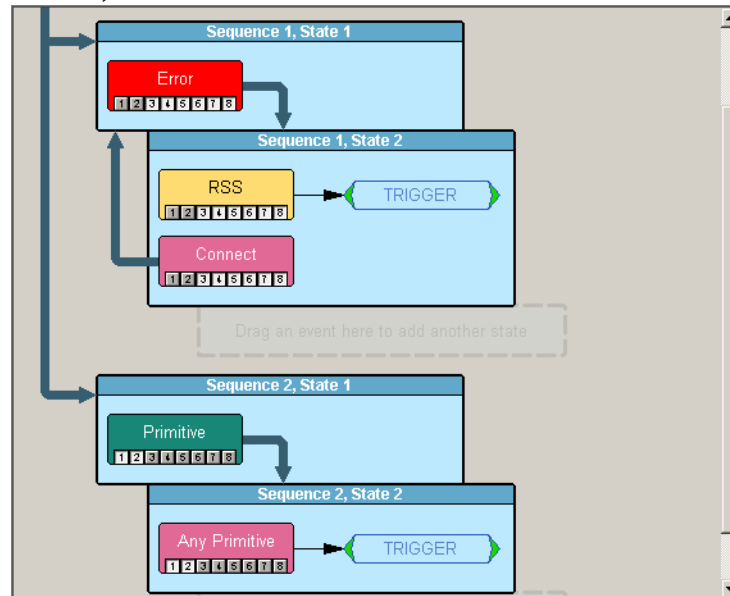
- Step 1** Drag an event button to a Sequence cell.
- Step 2** Right-click on the button. A pop-up menu appears.
- Step 3** Select **Specify Actions** from the menu. A sub-menu appears (shown above).

Creating Multiple Sequence Cells

By default, only one Event cell displays in the window when you begin configuring. However, as soon as you drag a button into a Sequence cell, additional Event cells will be automatically created.

FCTracer Supports Up to Two Sequences

FCTracer supports up to two independent sequences ("Sequence 1" and "Sequence 2") as shown below:



Sequences are made up of cells called *States*. A state is a stage within a sequence that specifies what events the analyzer should look for and what actions to apply when the event occurs.

In the example above, Sequence 1 and 2 are composed of two states each. The maximum number of states a sequence can support is 256.

The foregoing example reads: "Search for Sequence 1 and 2 and trigger on whichever sequence occurs first."

Sequence 1 is the more complex of the two. It reads "If you see an error followed by an Extended Link Service (RSS), trigger. However, if during that sequence, a FC Bus Event follows an error, restart the search at the beginning (i.e., State 1)."

Sequence 2 reads "Trigger if you see a Primitive (actually, a sub-type of Primitive that is not apparent in the screen) followed by Any Primitive."

How to Create an Event Sequence

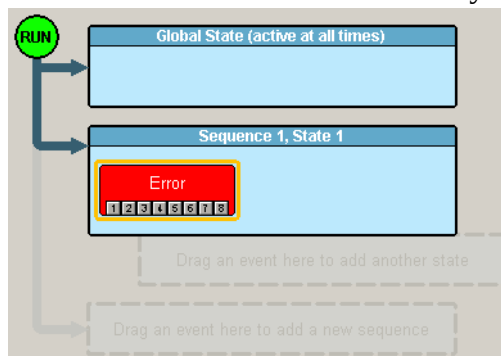
To create an event sequence, you drag event buttons to the cell marked "Drag an event here to add a new sequence," link them with the action **Advance the Sequence**, then apply a trigger or other action to the end of the chain. The following steps illustrate how to create an event sequence.

Step 1 Click the **New Event** button. The **New Event** menu opens.

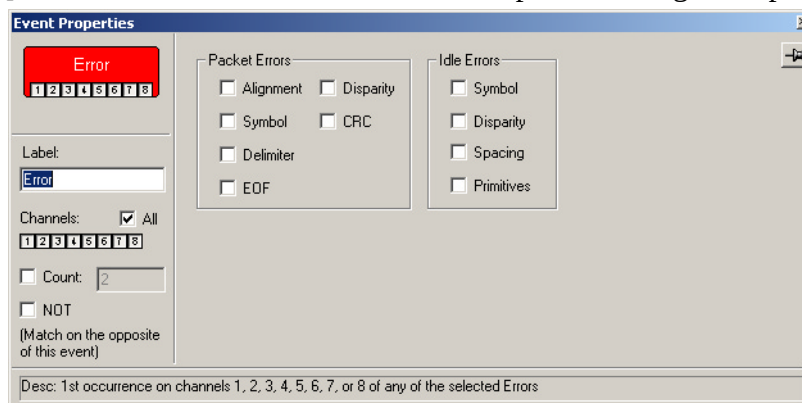
- Step 2** Select an event type from the menu, for example an error. A button appears in the **Available Events** area.
- Step 3** Click the **New Event** button and select a second event type, for example a Primitive. At this point, you should see two buttons in the **Available Events** area.



- Step 4** Drag the first button to the cell marked "Drag an event here to create a sequence." When you finish, notice how two new cells appear in the window as shown below the cell where you placed your button.

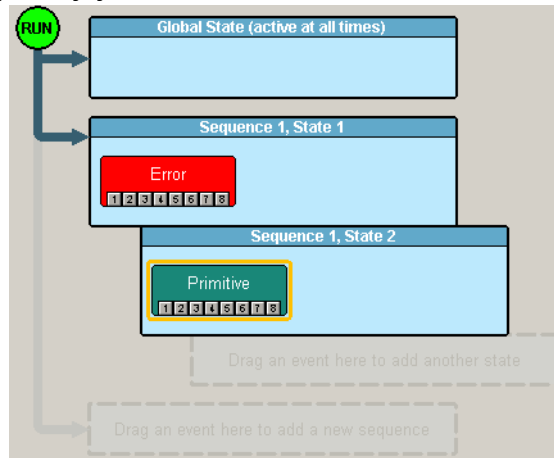


- Step 5** Double-click on the button. A Properties dialog box opens.



- Step 6** Select desired options from the dialog box, for example an error sub-type. The options apply immediately.
- Step 7** Close the Properties dialog box by clicking the X in the top right corner. The Properties dialog box closes.
- Step 8** Drag the second event button to the cell immediately below the cell

occupied by your first event button. Note that an additional cell

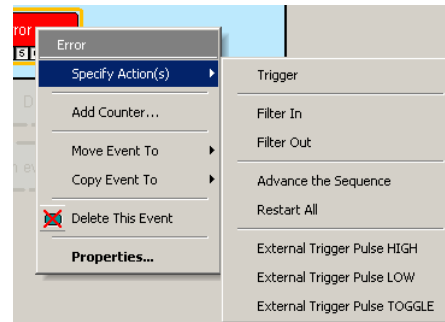


appears marked "Drag an event here to add a sequence."

Step 9 Right-click on the first event button. A pop-up menu appears.

Note Be sure to click on the button itself and not the cell. If you click the cell, you will get a different menu with fewer options.

Step 10 Select **Specify Actions**. Notice how this menu differs slightly from the menu shown earlier in this chapter. You will see three options for advancing or restarting a sequence:



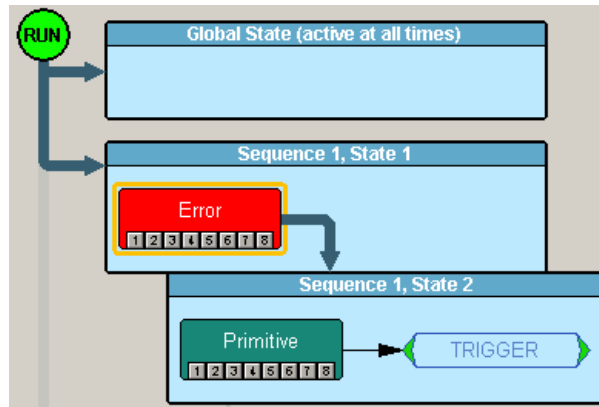
- **Advance the Sequence** - Draws an arrow that connects the selected event button to the event button below it. This option creates a sequence.
- **(Restart the Sequence)** - This option appears once you have linked two or more buttons in a sequence. This option draws an arrow upward from the selected event button to the first button.
- **Restart All** - Creates an arrow pointing a cell marked "Restart All." This option tells the analyzer to restart the search (i.e., Sequence 1, State1).

Step 11 Select **Advance the Sequence**. An arrow will appear that connects the first button to the second.

Step 12 Right-click the second button and select **Specify Actions**. A

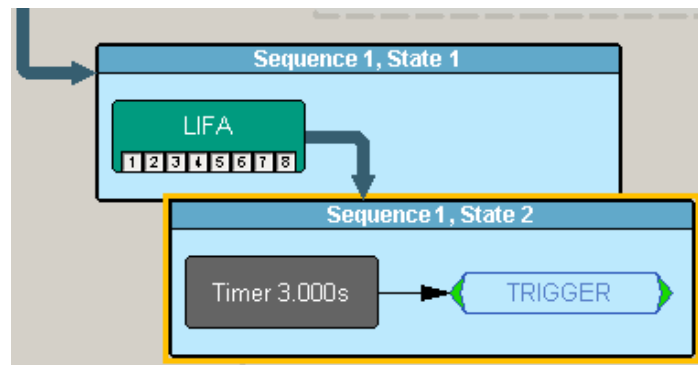
sub-menu appears.

- Step 13** Select **Trigger**. A cell will appear to the right of the second button saying "Trigger." Your sequence configuration is now complete and should look like this:



Using a Timer

Timers let you set a time-delay for a trigger or other action. The following example illustrates how timers work.

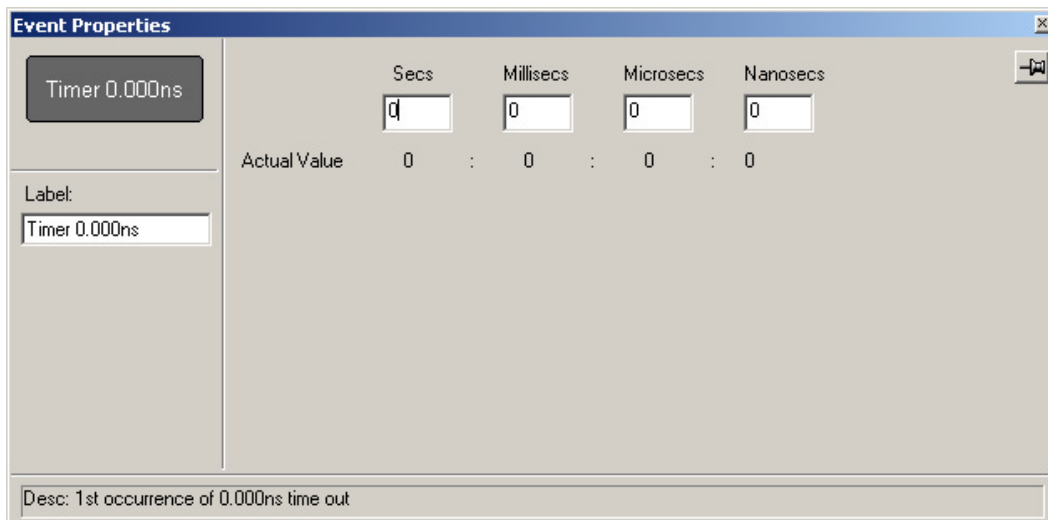


This example reads "Look for a Extended Link Service LIFA. When you see one, wait three seconds then trigger."

To create the example shown above, perform the following steps:

- Step 1** Click the **New Event** button to open the Event menu.
- Step 2** Select an event such as FC Loop Initialization (LIFA) from the menu. An event button appears in the **Available Events** area.
- Step 3** Drag the event button into a Sequence cell marked "Drag an event here to add another state." Once the button is added, the cell turns blue and acquires a title like "Sequence 1, State 1." Below the cell, a new cell appears marked "Drag an event here to add another state."

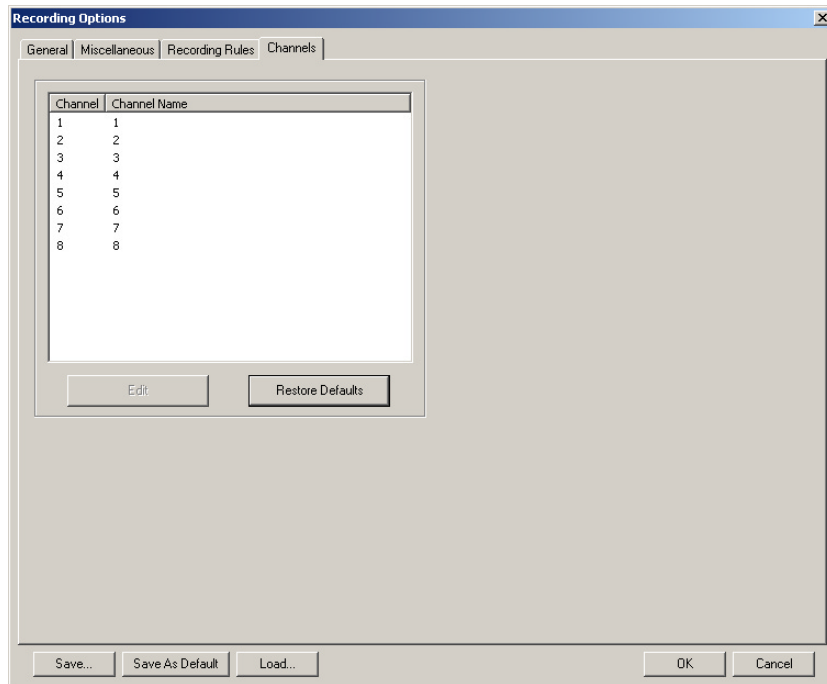
- Step 4** Click the **New Events** button. The Events menu opens.
- Step 5** Select **Timer**. A Timer button appears in the **Available Events** list.
- Step 6** Drag the Timer Button to the cell marked "*Drag an event here to add another state.*" The cell turns blue and acquires a title like "Sequence 1, State 2."
- Step 7** To link the two events into a sequence, right-click on the first event (in our example, the LIFA event button). Be sure to click on the event button and not on the cell. A pop-up menu appears.
- Step 8** Select **Specify Action(s)**. A sub-menu opens.
- Step 9** Select **Advance the Sequence**. The menu closes and an arrow appears that connects this cell to the State cell below.
- Step 10** Right-click on the Timer button. A pop-up menu appears.
- Step 11** Select **Specify Action(s)**. A sub-menu opens.
- Step 12** Select **Trigger**. The menu closes and an arrow appears that connects the Timer button to a new cell to the right marked **Trigger**.
- Step 13** To set the duration of the Timer, double-click on the Timer button. A dialog box appears.



- Step 14** Enter a time value in the boxes.
- Step 15** Click the **x** to close the dialog box. The timer is now set.

5.18 Recording Options - Channels

The Channels page allows the channel names to be customized. To change a channel name, select the channel, then click the edit button and enter the new text, then click **OK**. Once the options are set, the analyzer will update the open trace and all future traces with the new channel names.

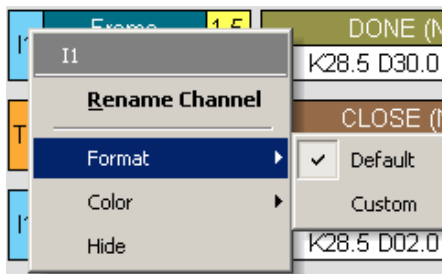


Where Custom Channel Names Appear

Custom channel names appear in two places:

- The trace itself
- Link Tracker window

Custom Channel Names in the Trace - Custom channel names do not appear right away in the trace: the original names continue to display. To see the custom channel names, click in the first cell of the trace (the channel cell) and select **Format** from the pop-up menu, then select **Custom**.



The custom names will then appear in the trace.

1	Frame	1	ARB(val)	val	TimeDelta	Time Stamp
	0	G	K28.5 D20.4 val val	0xF0	30.000 ns	00 : 00 : 00 . 006 963 810
Channel 1	Frame	1	ARB(val)	val	TimeDelta	Time Stamp
	0	G	K28.5 D20.4 val val	0xF0	30.000 ns	00 : 00 : 00 . 006

Channel 1 renamed as Channel 1.

Custom Channel Names in the Link Tracker Window - Tooltips in the Link Tracker window will show custom channel names as soon as they have been customized.

Time	Packet #	1	2
00.011 782 060		R_RDY	
00.011 782 097	293 (2)		
00.011 782 135			
00.011 782 173	294 (1)	R_RDY	
00.011 782 210			
00.011 782 248			
00.011 782 286	295 (1)	R_RDY	
00.011 782 323			
00.011 782 361			
00.011 782 399	296 (1)	R_RDY	
00.011 782 436			

Packet 292 (1), dword #0 (1 dword total)

Hex Value	BC954A4A
10 bit Code	0FA 2A2 155 155
Symbols	K28.5 (-) D21.4 (+) D10.2 (-) D10.2 (-)
Text Decoding	R_RDY

6. Display Options & Application Preferences

FCTracer has two sets of options for controlling the appearance of the application: the Display Options dialog and the Application Preferences dialog.

Display Options dialog - Controls how traffic is displayed in the trace window. This dialog controls the appearance of the trace itself: the colors, format and other characteristics of the trace.

Application Preferences dialog - Controls how commands are listed in the application's menus. This dialog lets you list commands by Opcode or name, and set defaults for the link speed.

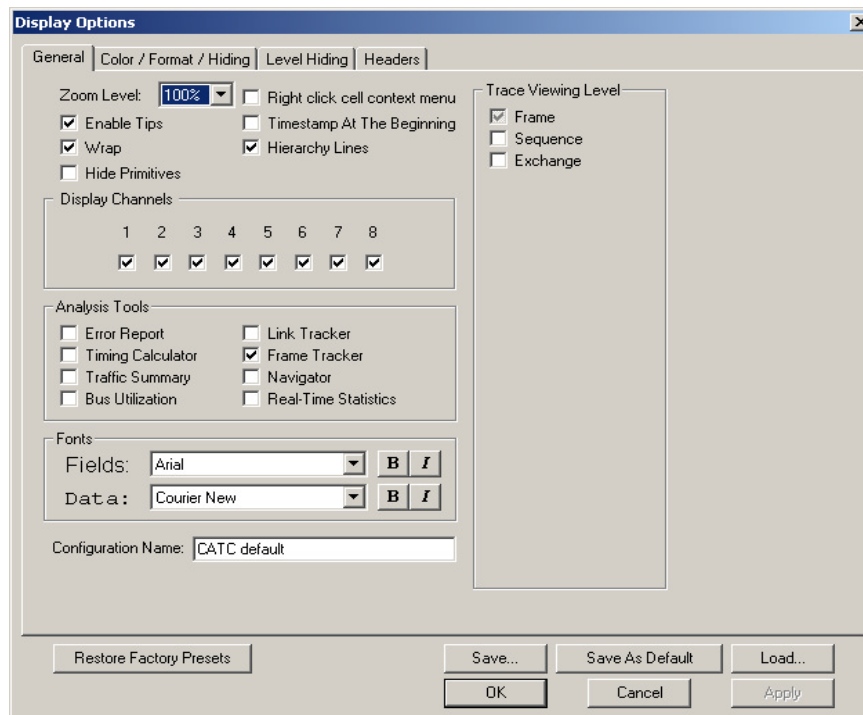
6.1 Setting Display Options

The **Display Options** dialog controls the way CATC Trace information is displayed - meaning the trace colors, data format (hex, binary, ASCII etc.), and the hiding of cells and frame types.

To open the **Display Options** dialog,

- Select **Display Options** under **Setup** on the Menu Bar
- OR
- Click  on the Tool Bar

The **Display Options** dialog opens:



The **Display Options** window always opens with the **General** page options displayed.

6.2 General Display Options

The General Display Options controls the zoom level, tool tips behavior, wrap and other general features:

- **Zoom Level:** Adjustable in discrete increments from 10% to 200% percent.
- **Enable Tool Tips:** Select to enable tool tips with explanation text to pop up when you position your cursor over various fields in the Trace View.
- **Wrap:** Inhibits carriage returns in packets when they exceed the width of the window.
- **Hide Primitives:** Shows/hides Primitives in the trace.
- **Right-click cell context menu:** Causes FCTracer swap the right and left mouse button functions
- **Timestamp At The Beginning:** Moves the timestamp from the end of the Frame to the beginning.

- **Hierarchy Lines:** Adds faint lines to the left side of the trace window showing the hierarchical relationship between the different decode/display levels (Frames, Sequences, and Exchanges.)
- **Trace Viewing Level:** Lets you display the following elements in the CATC trace: Frames, Sequences, and Exchanges.
- **Display Channels:** Shows/hides traffic from selected channels.
- **Analysis Tools:** Shows/Hides the various reporting utilities.
- **Fonts:** Lets you define the appearance of Field and Data text.
- **Display Configuration Name:** A descriptive label intended to clarify the contents of the Display Options file name.

6.3 Saving and Loading Display Options

To save your Display Options settings for future use,

- Step 1** Click **Save** to save the currently specified Display Options for use in future sessions. Any file name can be specified, but you must use the **.opt** extension. If no extension is specified, **.opt** is added by default.
- Step 2** Click **OK** to apply any changes you have made to Display Options and close this dialog box.
- Click **Cancel** to cancel any immediate changes you have made and exit the Display Options menu.
 - The **Save as Default** function is equivalent to the **Save** function, specifying the file name **default.opt**. Whenever you start up the analyzer, it automatically loads the **default.opt** file if one exists.

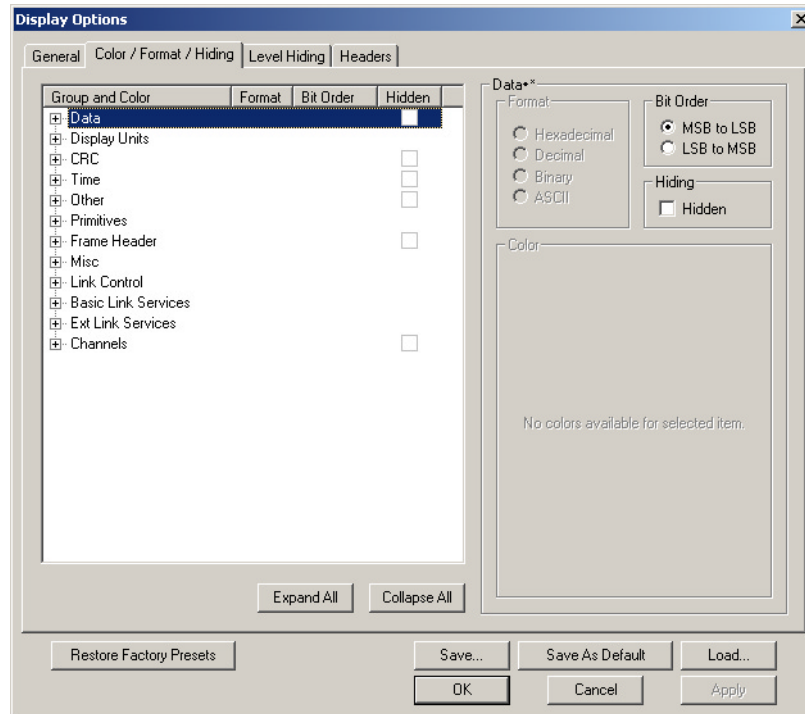
To load Display Options,

- Step 1** Click **Load**.
- A dialog box opens with a list of previously saved Display Options.*
- Step 2** Select a previously saved ***.opt** file.
- Step 3** Click **Apply** to apply your changes.

6.4 Color/Format/Hiding Display Options

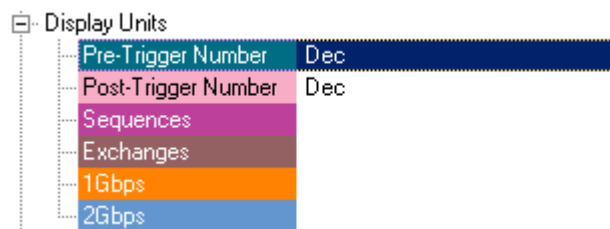
The **Color/Format/Hiding** property page controls field color and data format (binary, hex, decimal, ASCII), and lets you hide selected fields from the display.

Click the **Color/Format/Hiding** tab on the Display Options screen.



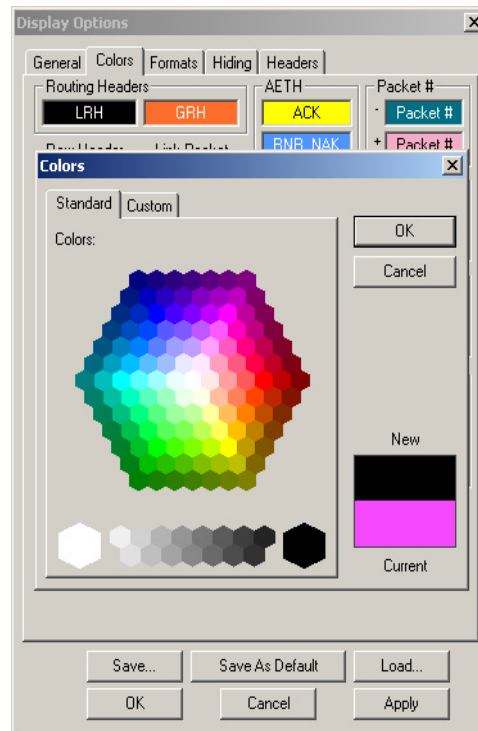
Setting Field Colors

- Step 1** Open Display Options (View > Set Display Options ...)
- Step 2** Under the Group and Colors column, click the plus symbol (+) next to the group you want to reformat. The group will expand to show the individual fields within the group. Each field will have a color as shown below:



- Step 3** Click in the colored cell that you want to change. A color palette

appears.



Step 4 Click in a color in the palette, then click **Apply** or **OK**.

Note: The colors of the following Frame types cannot be changed:

- Invalid Data (frame error) field (red)
- Softbit Errors (yellow)

Two color fields are provided for frame, sequence, or exchange number displays to differentiate between pre-Trigger traffic and post-Trigger traffic.

- The frame, sequence, or exchange that causes the Trigger and all the packets before it are colored with the - color.
- The frame, sequence, or exchange that follows a Trigger is colored with the + color.
- All packets are colored with a + color when there is no Trigger.

Use the color buttons labeled + and - under the **Frame, Sequence, Or Exchange #** section of the Colors screen to select a Trigger color.

To select or change a color,

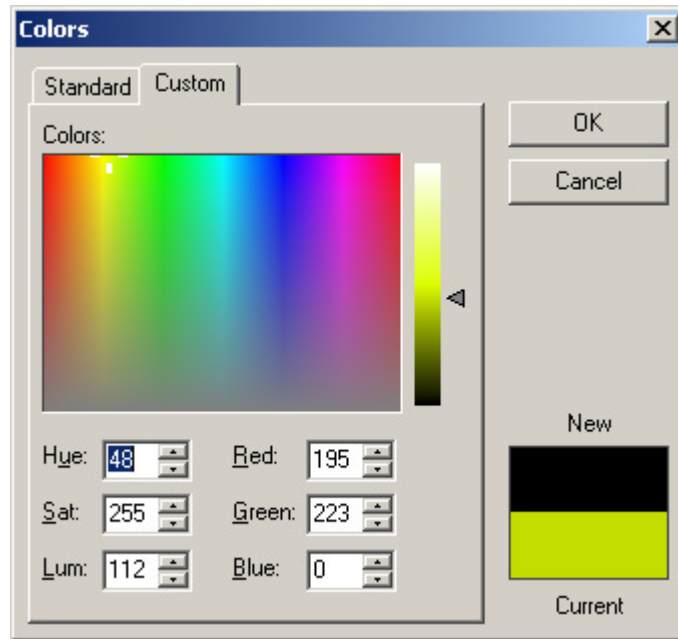
- Click the appropriate color button.

You see the color palette.

Use this palette to choose the desired color for fields within the trace such as Routing Headers, Base Transport Headers, CRC, and Frame, Sequence, Or Exchange #.

You can also customize colors.

Step 1 Click the **Custom** tab.



Step 2 Click your mouse pointer in the color spectrum on the desired color.

Step 3 Drag the triangle on the vertical bar to the desired shade.

Step 4 Click **OK**.

Changing Field Formats

You can display numerical data in different format, such as hexadecimal or binary.

To change the format of alphanumeric characters in a field,

Step 1 Under the Group and Colors column, click the plus symbol (+) next to the group you want to reformat. The group will expand to show the individual fields within the group.



Step 2 Click in anywhere in the row representing the field that you want to reformat. If the field can be reformatted, the format options at the top

of the dialog box will become active as shown below:

Click an item to display its current format characteristics and to display formatting buttons. Use the formatting buttons to change the format of the selected item.

Hiding Fields

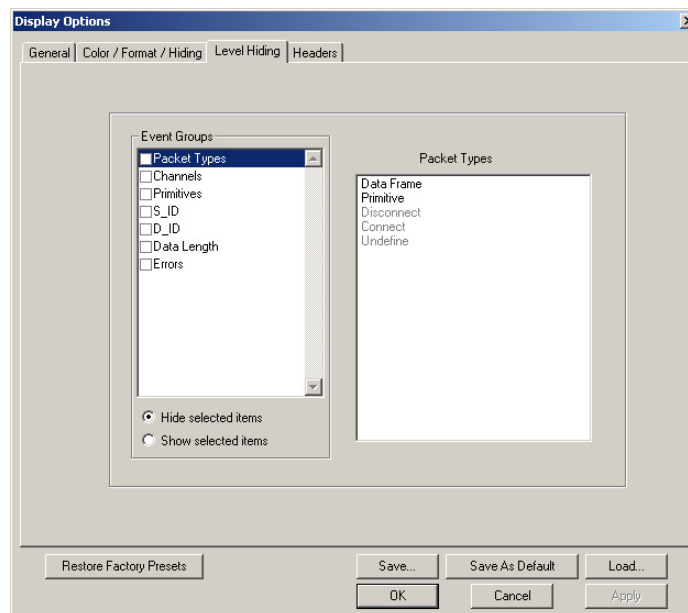
Use this window to hide various fields, packets, messages, and protocols from the Trace View screen. You can hide specific fields, by default, for all recordings. Use the Show/Hide option under the View menu to hide specific fields for the active recording.

To hide a field,

- Step 1** Under the Group and Colors column, click the plus symbol (+) next to the group that has the field(s) you want to hide. The group will expand to show the individual fields within the group (as shown above).
- Step 2** Click in the checkbox in the row representing the field that you want to hide.
- Step 3** Click **Apply** or **OK**.

6.5 Hiding Levels

The Level Hiding page lets you hide traffic by event group. If you select one or more event types from the Event Group list, the selected types will be hidden from the trace.



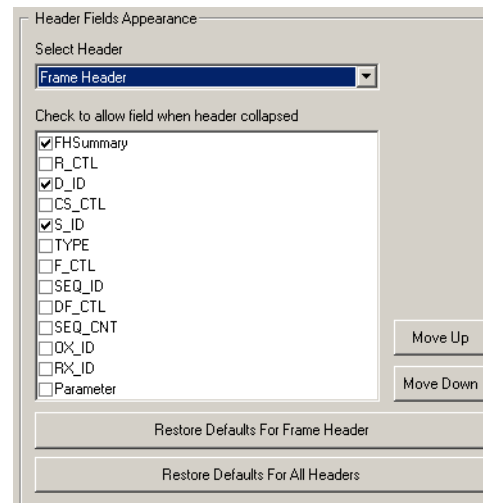
6.6 Display Options - Headers

The Headers page lets you add, remove, and reorder the fields that are displayed when a header is in a collapsed state. You expand or collapse headers by clicking the small triangle in the first cell of the header. by default, a collapsed state header display three fields: the Header summary, the Destination ID (D_ID), and the Source ID (S_ID).

FH	FCP_CMND	D_ID	S_ID
	FCP-2	0x0000EF	0x000001

If you want to add or remove header fields when a header is collapsed, you use the Display Options Header page, shown above.

- Step 1** Select **Setup > Display Options > Headers** to open the Display Options Headers page.
- Step 2** Select the fields you want displayed and check the boxes in the column marked "Check to allow header when field collapsed."
- Step 3** To re-order the fields, select a field of interest in the list (i.e., click on it so it is highlighted), then click the **Move Up** or **Move Down** buttons. In the example shown right, the D_ID field has been unchecked, and the S_ID field has been moved up.
- Step 4** Click **OK**. The dialog box closes. The new configuration takes effect as shown in the example below:



FH	FCP_CMND	S_ID
	FCP-2	0x000001

To restore headers to their defaults, press the button marked **Restore Frame Header Defaults**.

6.7 The Application Preferences Dialog

The Application Preferences dialog controls how commands are listed in menus and sets defaults for the link speed and FCP SCSI decoding.

To open the Application Preferences dialog, select **Setup > Application Preferences** from the menu. The following dialog opens.

The Application Preferences dialog has the following options:

Command Sorting

Allows commands in menus to be sorted by name or by Opcode.

- **Basic Link Services**
- **Extended Link Services**
- **FCP SCSI**
- **SW_ILS**

FCP SCSI Default Decoding

Sets the default decoding for FCP SCSI any time there is a conflict due to the sharing of Opcodes by command sets.

Select from one of the following four command sets:

- **SCSI Primary Command set (SPC-3)**
- **SCSI Block Command set (SBC-2)**
- **SCSI Media Changer Command set (SMC-2)**
- **SCSI Stream Command set (SSC-2)**

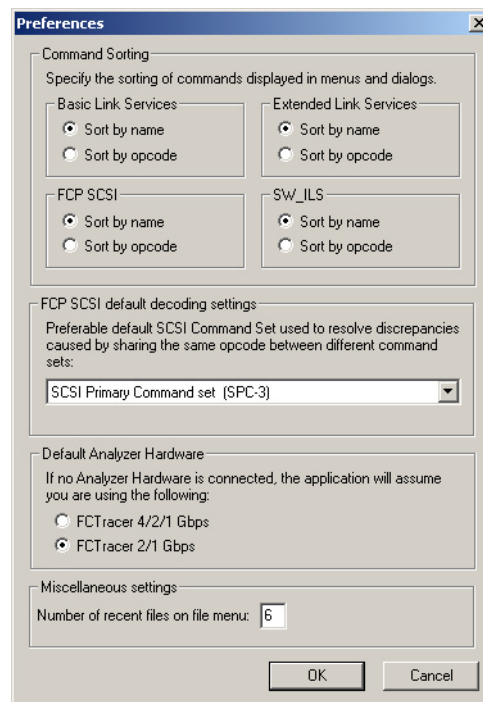
Default Analyzer Hardware

Sets the hardware platform when an analyzer is not attached. When an analyzer is attached to a host PC, the hardware platform is detected and the speed set accordingly.

- **FCTracer 4/2/1 Gbps**
- **FCTracer 2/1 Gbps**

Number of Recent Files on File Menu

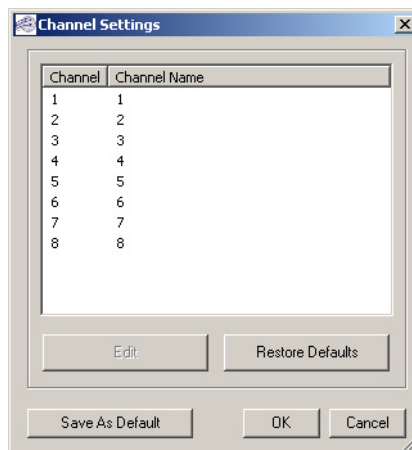
Sets how many recently opened files appear at the bottom of the File menu.



6.8 Setting Channel Names

The Channel Settings dialog allows the names of the channels within the trace window to be renamed. By default, the channels are numbered.

To customize the channel names, select **Setup > Channel Settings** from the menu. The following dialog opens:



To change a channel name, select it from the list, then click **Edit** and enter a new name. The new name will appear in the column marked **Channel Name**. The new name(s) only affects the open trace. If you would like to use your new settings for all traces, select **Save as Default**.

7. Navigating a CATC Trace

1	Frame	1	G	SOFn3	FH	FCP_DATA	D_ID	S_ID	Data
	100385					FCP-2	0x0000EF	0x000001	512 dwords
2	Frame	1	G	SOFi3	FH	FCP_RSP	D_ID	S_ID	Data
	100443					FCP-2	0x000001	0x0000EF	6 dwords
1	Frame	1	G	SOFi3	FH	FCP_CMND	D_ID	S_ID	Data
	100509					FCP-2	0x0000EF	0x000001	8 dwords
2	Frame	1	G	SOFi3	FH	FCP_XFER_READY	D_ID	S_ID	Data
	100564					FCP-2	0x000001	0x0000EF	3 dwords

7.1 Trace View Features

- The FCTracer view display uses color and graphics extensively to fully document the captured traffic.
- Sequences are shown on separate rows, with their individual fields both labeled and color coded.
- Frames are numbered (sequentially, as recorded), time-stamped, and highlighted to show the device status (master or slave).
- Pop-up Tool Tips annotate frame, sequence, or exchange fields with detailed information about their contents.
- Several fields such as Data fields can be collapsed to occupy minimal space in the display.

7.2 Expanding & Collapsing Traffic

Sequences and Exchanges can be "opened" to reveal their constituent packets by double-clicking the first cell in of a Sequence or Exchange or by clicking once on the small arrow on that same cell. The Sequence and/or Exchange will then display below the message. The following snapshot shows an example:

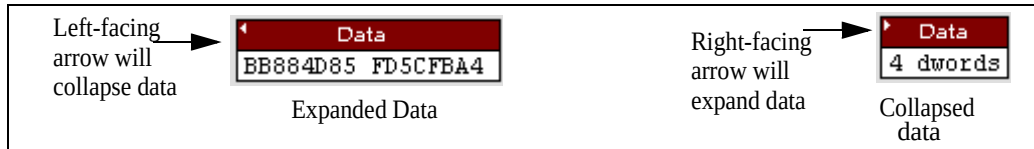
1	Exchange	Originator	Responder	OX_ID	RX_ID	FCP SCSI	CDB	WRITE	Exchange
2	2	0x000001	0x0000EF	0x044D	0xFFFF				
1	Sequence	S_ID	D_ID	OX_ID	RX_ID	SEQ_ID	EC	F/M	Sequence
	6	0x000001	0x0000EF	0x044D	0xFFFF	0x00	0	F	
		SCSI LUN		SCSI CDB		WRITE(10)			
		0000 0000 0000 0000							
1	Frame	1	G	SOFi3	FH	R_CTL	D_ID	S_ID	Frame
	114					0x06	0x0000EF	0x000001	

7.3 Expanded and Collapsed Field Formats

Fields that have small triangles in their top left corners can be expanded to display greater detail or collapsed to a compact view. There are three ways to toggle between the two views.

Left-clicking the Small Arrows in the Header and Data Fields

Some fields have small arrow in their top-left corners that allow the field to be expanded or collapsed.



Double-Clicking

You can also expand or collapse a header or data field by double-clicking anywhere in the field.

Expanding/Collapsing Fields via the Pop-up Menu

If you left-click on an expandable data or header field, a pop-up menu will open with an option for expanding or collapsing the fields.

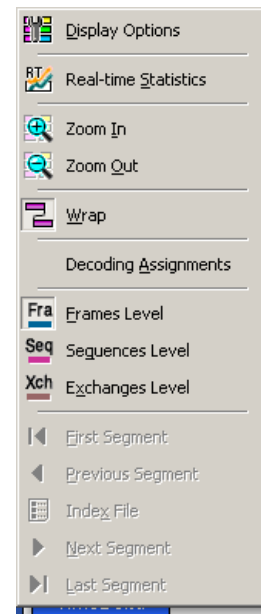
7.4 Pop-up Shortcut Menus

Clicking the left or right mouse button within the trace window will open context-sensitive shortcut menus.

Right Mouse Button

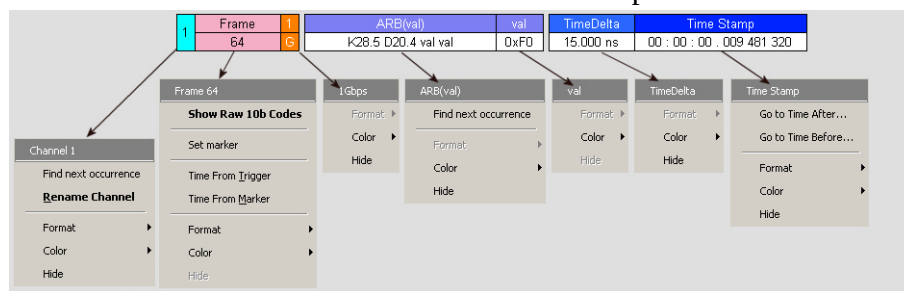
Clicking the right mouse button anywhere in the trace window opens a menu with shortcuts for changing the appearance of the trace:

- **Display Options** - Opens Display Options dialog.
- **Real-Time Statistics** - Opens Real-Time Statistics window.
- **Zoom In** - Zooms the display in.
- **Zoom Out** - Zooms the display out.
- **Wrap** - Wraps the frames to the next line if they extend beyond width of the trace window.
- **Decoding Assignments** - Opens the Decoding Assignments dialog for setting the default FCP SCSI decoding command set. This default is used any time the same Opcodes are used from different SCSI command sets.
- **Frame Level** - Decodes trace at the Frame level.
- **Sequence Level** - Decodes trace at Sequence level.
- **Exchanges Level** - Decodes trace at Exchanges level
- **First Segment** - If a multi-segment trace (*.mtt) has been opened, this option will display the first segment file.
- **Previous Segment** - Shows previous segment of a multi-segment trace.
- **Index File** - Opens the index file for a multi-segment trace.
- **Next Segment** - Opens the next segment in the multi-segment trace.
- **Last Segment** - Opens the last segment in a multi-segment trace.



Left Mouse Button

Clicking the left mouse button in the trace window opens a context-sensitive menu. The menus presented will vary depending on which part of the trace has been clicked. The following screenshot shows the pop-up menus that would occur for the different cells within a ARB primitive.



7.5 Tool Tips

Tool tips are pop-up boxes that provide additional information about fields. In some cases, tool tips function as a legend and spell out acronyms that appear in a cell. In other cases, tool tips provide substantial additional information about fields.

2	Frame	1	R_RDY	TimeDelta	Time Stamp
	20	G	k28.5 D21.4 D10.2 D10.2	-90 ns	0000.006 964 125 s
1	Frame	1	ARB(val)	val	This time delta is measured from the beginning of this frame to the beginning of the next frame on the screen. It is negative because this Frame started later than the next Frame on the screen.
	21	G	k28.5 D20.4 val val	0xF0	
1	Exchange	Originator	Responder	OX_ID	RX_ID
2	0	0x000001	0x0000EF	0x044C	0xFFFF

7.6 Navigating with Trace Navigator

The Trace Navigator is a navigation and display tool designed to control the amount of trace displayed in the main window. The Navigator is a bar that can be displayed on the right side of the window. The bar represents the entire trace. By dragging the top and bottom of the Navigator bar you can restrict how much traffic is displayed in the main window. For example, you could reduce the displayed traffic in a 10,000 frame trace to a 100 frames.

Navigator also shows you where errors occur in the trace. You enable Errors to display by right-clicking in the Navigator and selecting Errors from the pop-up menu. Errors will then display as horizontal lines running across the width of the Navigator.

To display the Navigator bar, select **Setup > Display Options** and then select the **Navigation Bar** checkbox.

Scaling

The top of the Navigator bar corresponds to the first frame in the trace, and the bottom corresponds to the last frame.

A one pixel high line in the Navigator bar represents a fraction of the trace data. If, for example, the Navigation bar were 400 pixels high, then each bar in this example would represent 1/400 of the trace. If the trace had 4000 frames total, each bar would represent 10 frames.



Layout

The Navigator bar is made up of three parts: Pre-Trigger traffic, Post-Trigger traffic, and errors.

To see all three components, you will need to enable them by selecting Pre/Post Trigger and Errors from the pop-up menu.

Pop-up Menu

Right click anywhere on the Navigator to display the pop-up menu. The following options are available:

- **Pre/Post Trigger** - Shows/hides the Trigger event as a line in the Navigator
- **Errors** - Shows/Hides errors as red lines in the Navigator
- **Set Range To Whole Trace** - Resets the range so all traffic is displayed
- **Set Range Near Frame xxx** - Collapses the range so that only the frames immediately above and below the xxx frame are displayed. The xxx frame is whatever frame is visible at the top of the main window.
- **Recently Used Ranges** - Displays a history of ranges that were previously selected.

Positioning

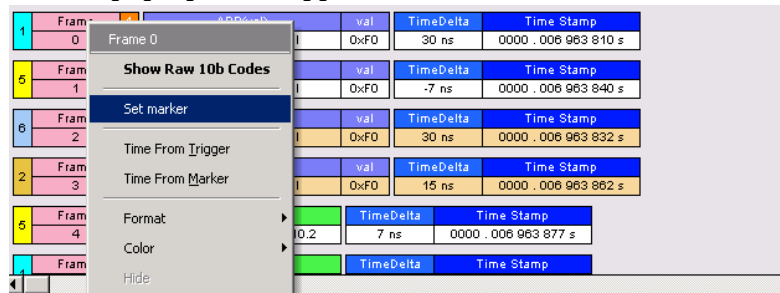
The Navigator bar can be repositioned in the trace and can be oriented horizontally or vertically, docked or undocked by dragging the parallel bars at the top or side of the Navigator bar. By default, the Navigator bar appears vertically to the right of the trace window. Drag the square at the top of bottom to set the size of a frame range. Drag the entire square to set the frame range to different values. A bubble appears showing the frame range while you are setting it. Set Marker

You can define a unique marker for each frame, sequence, or exchange.

To place a marker,

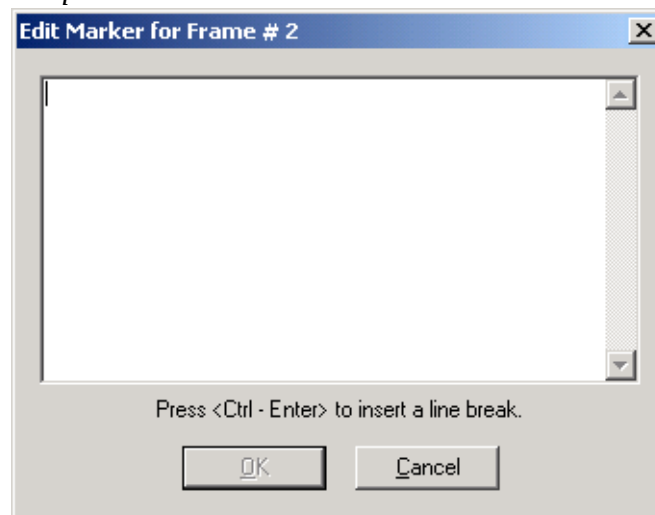
- Step 1** Left-click on **Frame, Sequence, or Exchange #** that you wish to mark.

A pop-up menu appears:



Step 2 Select **Set Marker**.

You see the **Edit Marker Comment** window where you can enter a unique comment.



Step 3 Enter your comment.

Step 4 Click **OK**.

A marked frame, sequence, or exchange is indicated by a vertical red bar along the left edge of the number (#) block:

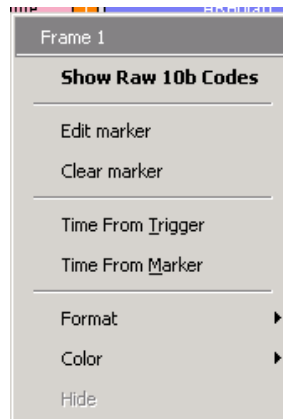
5	Frame	1	ARB(val)	val	TimeDelta	Time Stamp
		1	K28.5 D20.4 val val	0xF0	-7 ns	0000 . 006 963 840 s

7.7 Edit or Clear Marker

To clear or edit the comments associated with a frame, sequence, or exchange marker,

Step 1 Left-click on the cell marked "**Frame #**", "**Sequence #**", or "**Exchange #**."

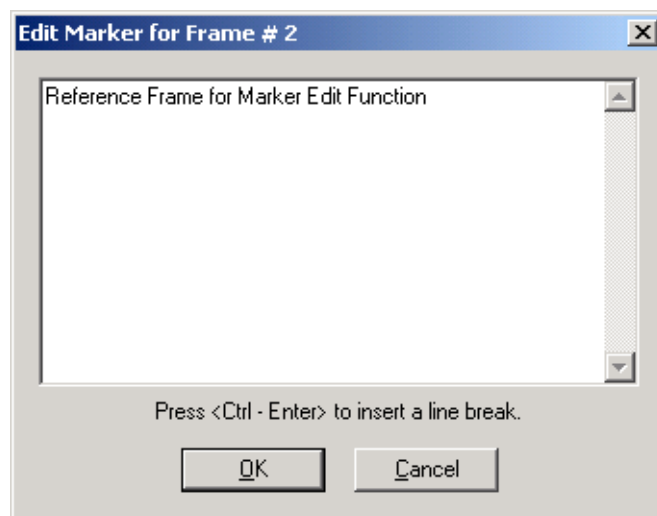
A pop-up menu appears:



To edit the Marker Comment,

Step 2 Select **Edit marker**.

*You see the **Edit marker comment** window:*



Step 3 Edit the comment as desired.

Step 4 Click **OK**.

To clear a Marker,

Step 5 Click **Clear marker**.

The vertical red Marker bar disappears.

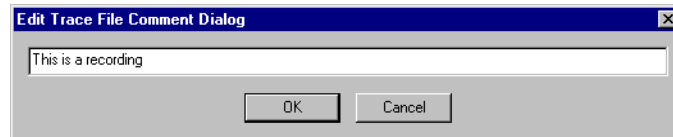
7.8 Edit Comment

You can create, view, or edit the 100-character comment field associated with each Trace file.

Step 1 Select **Edit Comment** under **File** on the Menu Bar.

Step 2 Create, view, or edit the comment.

*You see the **Edit comment for trace file** window:*



Step 3 Click **OK**.

8. Decoding Traffic

FCTracer has three decode levels: Frames, Sequences, and Exchanges,

The FCTracer default decode/display level is *Frame*, which means that Fibre Channel *Frames* will be displayed when you first view a trace.

5	Frame	1	ARB(val)	val	TimeDelta	Time Stamp
	25	G	K28.5 D20.4 val val	0xF0	907 ns	0000 . 006 964 140 s

8.1 Decoding and Displaying Traffic

You can decode and display traffic through the toolbar or by selecting a decode level from the Display Options dialog box.

Decoding Via the Toolbar

The decode buttons on the toolbar perform the following functions:

	Fra (Display Frames)
	Seq (Display Sequences)
	Xch (Display Exchanges)

To display, for example, Sequences, click .

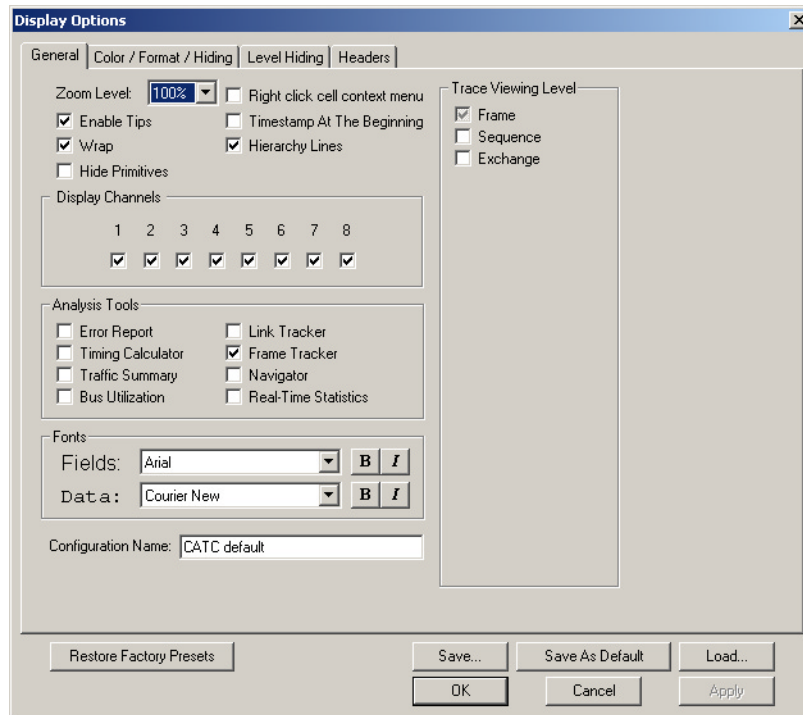
Note Once a decode has been performed, it might be necessary to scroll through the display to find the decoded data. You can shorten your search by first clicking the **Hide Primitives** and **Hide Unassociated Traffic** buttons.



Decoding Via the Display Options Dialog Box

The Display Options dialog box has options for issuing decode commands. To issue a command,

Step 1 From the menu bar, select

Setup>Display Options.

Step 2 From the checkboxes under **Trace Viewing Level**, select the desired level of decoding. Your choices are:

- **Frame**
- **Sequence**
- **Exchange**

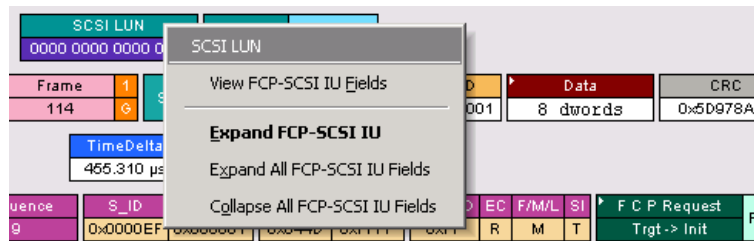
8.2 Viewing Details about FCP and SCSI Fields

You can get details about FCP and SCSI, by clicking on a transaction within the trace and selecting **View FCP-SCSI IU** fields from the pop-up menu. A dialog box will open with details about the selected transaction. This dialog box lets you search, save, and reformat the displayed data.

Viewing FCP-SCSI Fields

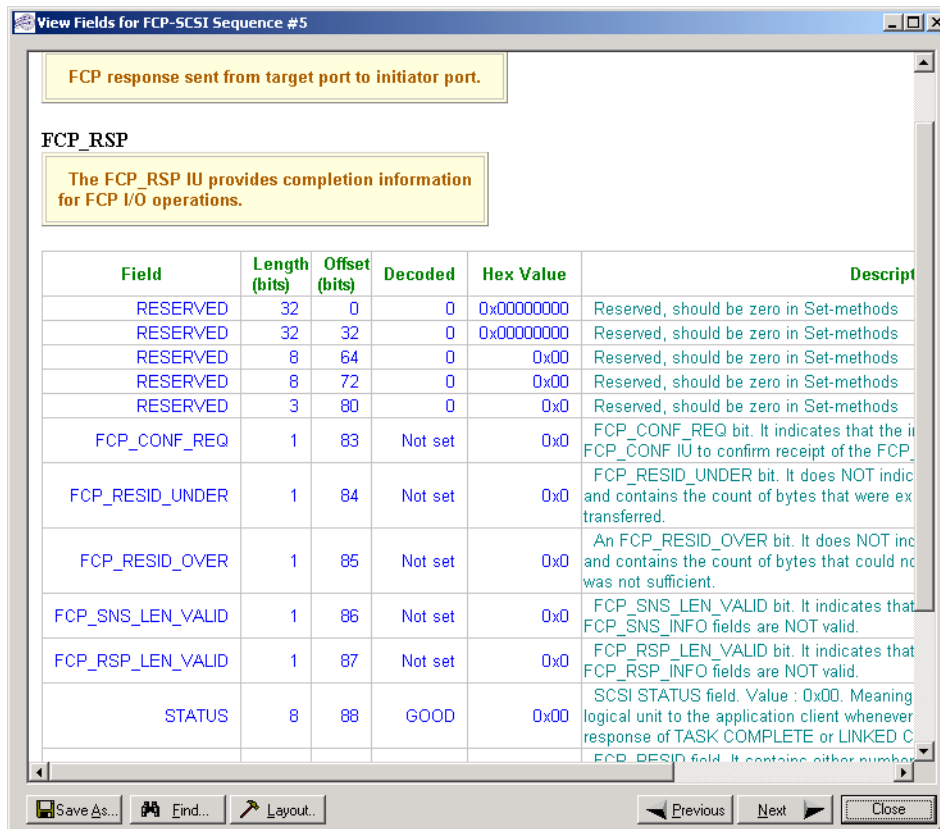
The dialog boxes for viewing details about FCP and SCSI transactions are the same. The following steps describe viewing details about FCP and SCSI.

Step 1 Click on a **FCP Command**, **FCP Request**, or **SCSI LUN** to open a pop-up menu:



Step 2 Select **View FCP-SCSI IU Fields**.

The following screen appears:



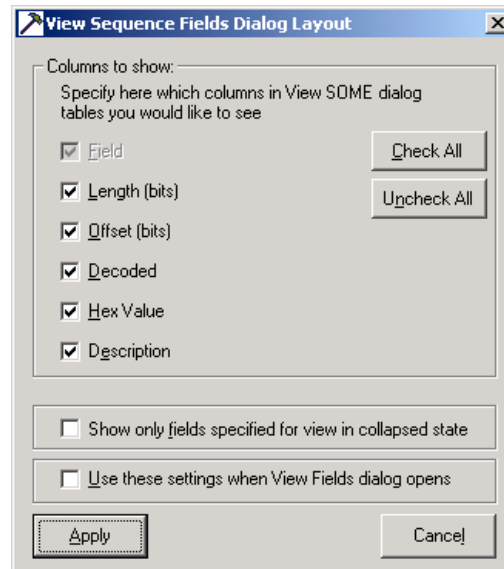
The window displays details about the FCP or SCSI. Field information is displayed vertically in sections. You can scroll down through the window to see all the fields.

The bottom of the window has six buttons with the following functions:

Save As - Saves the current configuration in an HTML file.

Find - Opens a dialog box that allows you to search the window.

Layout - Opens a dialog box that allows you to set the columns that you want to display in the **View Fields for FCP-SCSI** window:



The options at the bottom of the dialog box have the following functions:

- **Show only fields specified for view in collapsed state** - This option works in conjunction with the Decoder Script files. Decoder Script files are editable files that affect how FCP and SCSI are displayed in the trace.

The decoder files contain options for displaying FCP and SCSI attribute fields when the FCP and SCSI is in a collapsed state. By default, FCP and SCSI attribute fields are hidden when the FCP and SCSI is in collapsed state.

The option **Show only fields specified for view in collapsed state** looks at the View Settings options you set in the Decoder Script files and transfers the settings to the **View Fields for FCP-SCSI** window. If, for example, you specified in the Decoder Script file that Field X should display when the FCP or SCSI is in collapsed state, **AND** if you checked the box marked **Show only fields specified for view in collapsed state**, then only Field X will display in the View Sequence fields dialog box.

- **Use these settings when View Fields dialog opens** - This option saves the current settings.

Previous - Displays the last table containing FCP or SCSI data.

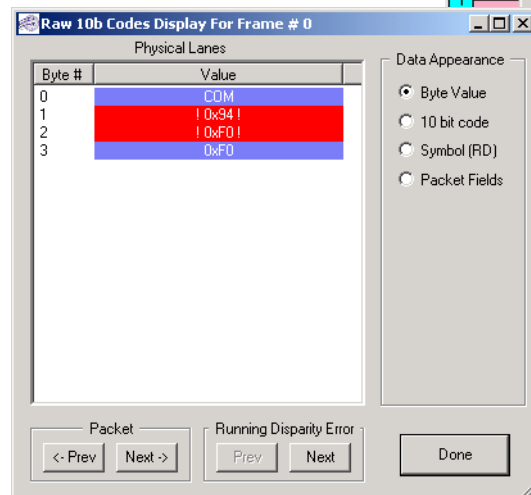
Next - Displays the next table containing FCP or SCSI data.

Close - Closes the window.

8.3 Displaying Raw 10b Codes

To view **Raw 10b Codes**, left-click on the first cell in a Frame and select **Show Raw 10b Codes** from the pop-up menu shown on the right.

The **10b Codes** window is laid out with packets as rows and physical lanes as columns.



Data Appearance - Data format is configurable. To change data format, select from the four options:

- **Byte Value** - Click to show hex values.
- **10 bit code** - Click the to show hex values.
- **Symbol (RD)** - Click to show symbol RD fields.
- **Packet Fields** - Click to show Packet fields.

Navigation - To move to the previous or next item in the trace, click one of the two **Packet** buttons at the bottom of the window:

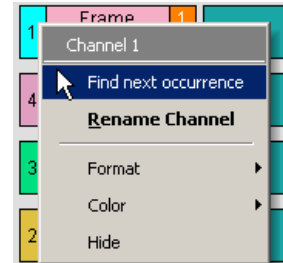
- **Prev** - Displays data for the previous packet in the trace.
- **Next** - Moves to the next packet in the trace.

9. Searching and Exporting

FCTracer and FCTracer 4G have several search commands that simplify the job of locating events of interest such as errors and triggers. These commands are launched from the Search menu.

9.1 Quick Search

When an event has been located, you can quickly search for the next instance of the same type of event by clicking in the first field of a frame (the one with the Channel number in it) and selecting **Find next occurrence**.



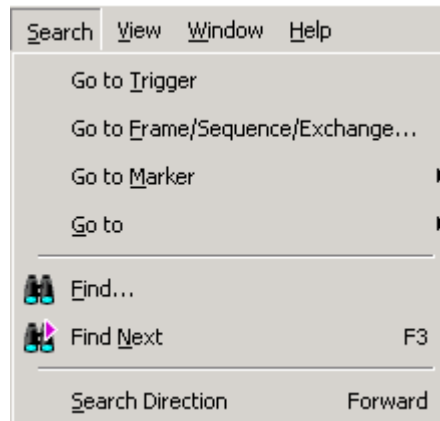
9.2 Search Menu

The Search feature provides several options for searching through recorded traffic, allowing you to find specific frames, sequences, or exchanges on triggering status, number, marking, or content.

To view the Search options,

- Click **Search** in the Menu Bar.

You see the Search drop-down menu:



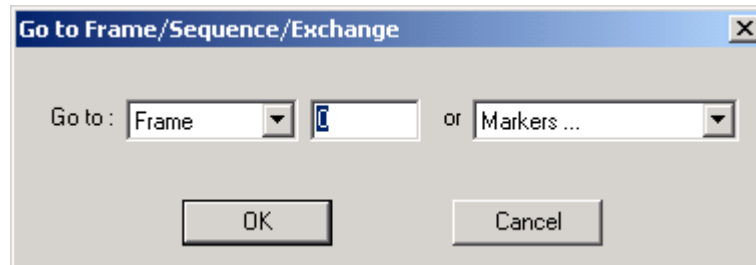
Go to Trigger

To display a triggering event, select **Go to Trigger** under **Search** on the Menu bar. The **Trace Viewer** display will reposition the trace to show the triggering event at the top of the screen.

Go to Packet

To display a specific packet,

- Step 1** Select **Go to Frame/Sequence/Exchange...** under **Search** on the Menu Bar.



- Step 2** Enter the number of the Frame, Sequence, or Exchange you want to display.

Or

Select a value from the drop-down list.

- Step 3** Click **OK**.

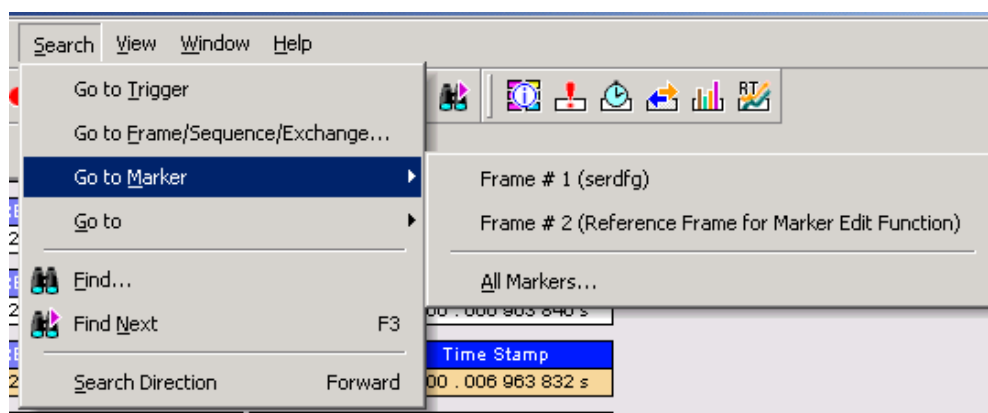
The Trace repositions to show the Frame, Sequence, or Exchange at the top of the screen.

Go to Marker

To instruct the analyzer to display a marked Frame, Sequence, or Exchange,

- Step 1** Select **Go to Marker** under **Search** on the Menu Bar.

You see a menu listing the marked items in that Trace View:



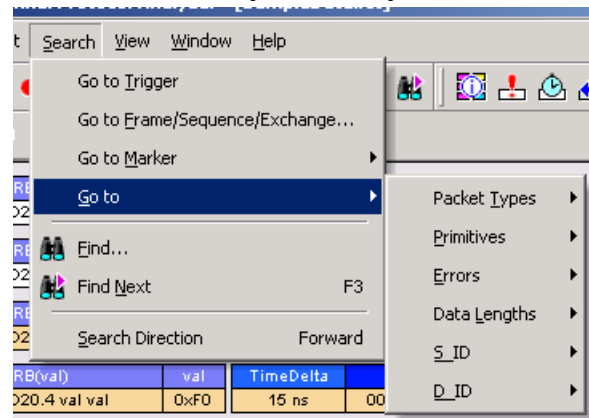
- Step 2** Select the desired packet from the displayed list.

The Trace repositions to show the marked item at the top of your screen.

Note The **Go to Marker** feature functions in conjunction with the **Set Marker** feature. The comments within the parentheses following each marked item are added or edited with the **Set Marker** feature.

Go to

The **Go To** feature takes you directly to an event in a Trace.



Find

Find allows searches to be conducted on an open trace using one or more criteria. You can search by Frame, Sequence, Exchange, and by fields within these items.

Find is run by selecting **Search > Find** or by clicking  on the toolbar.

Searches can combine criteria using the options **Intersection** and **Union**. **Intersection** creates AND statements such as "Find all Frames, Sequences, Exchanges with x and y." **Union** creates OR statements such as "Find all frames with x OR y."

You can also perform searches whereby Frames, Sequences, Exchanges, or events are excluded from a trace. The **Exclusion** allows searches to be conducted.

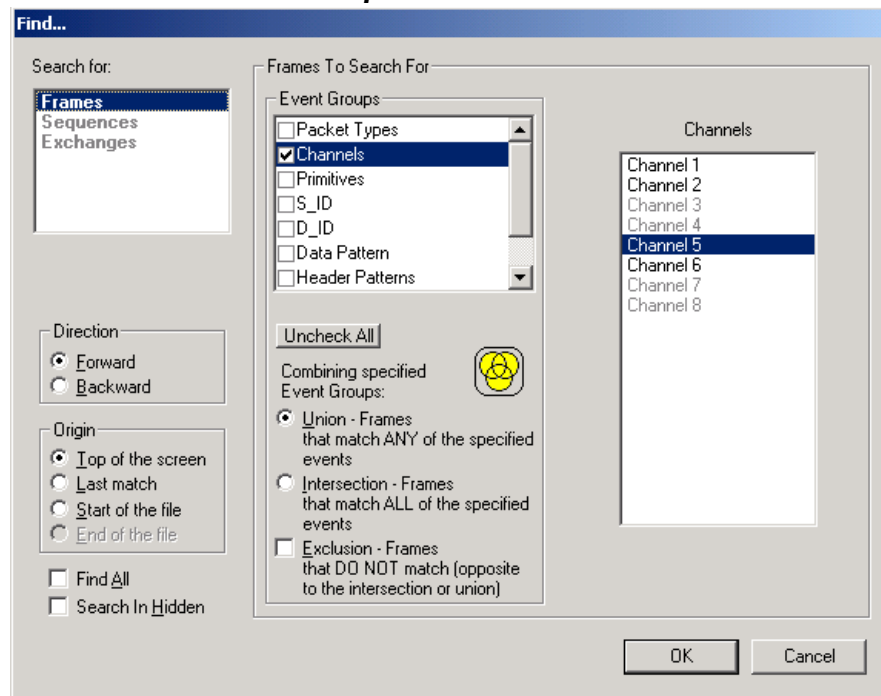
To perform a search,

Step 1 Select **Find...** under **Search** on the Menu Bar

OR

Click  in the Tool Bar.

You see the **User-Defined Find Events** screen:



Step 2 Select **Frames**, **Sequences**, or **Exchanges** from the top left list box.

Your choice will affect options presented in the Events Group box.

Step 3 Select one or more events from the **Events Group** box.

Step 4 Select one of the following options:

- **Union:** Find all items matching ANY of the specified events.



- **Intersection:** Find all items matching ALL of the specified events.



- **Exclusion:** Exclude items matching any of the specified events.

Exclusion works with the other two options. You select **Union** **AND** **Exclusion** to exclude items with ANY of the selected fields; or choose **Intersection** **AND** **Exclusion** to exclude items with ALL of the selected fields.



Step 5 If desired, set the search **Direction** and **Origin**.

Step 6 Click **OK**.

After the search finishes, the items meeting the search criteria will display.

Select the **Find All** checkbox to find all instances of an event group.

Select the **Search in Hidden** checkbox to find an event group that is hidden.

Find Next

To apply the previous **Find** parameters to the next search,

- Select **Find Next** under **Search** on the Menu Bar

OR

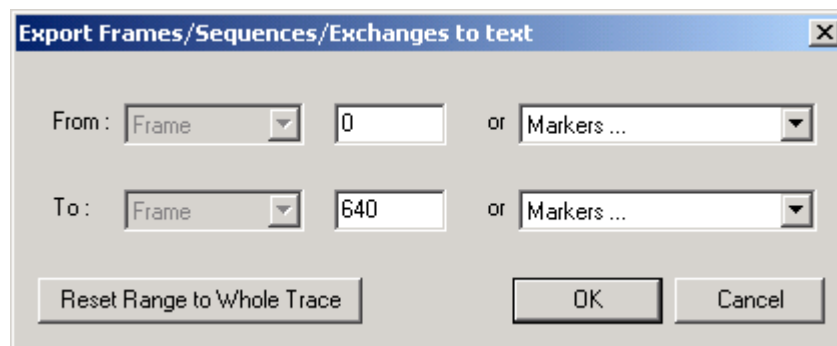
Click  on the Tool Bar.

9.3 Exporting Frames and Data

FCTracer allows users to export trace data into text files.

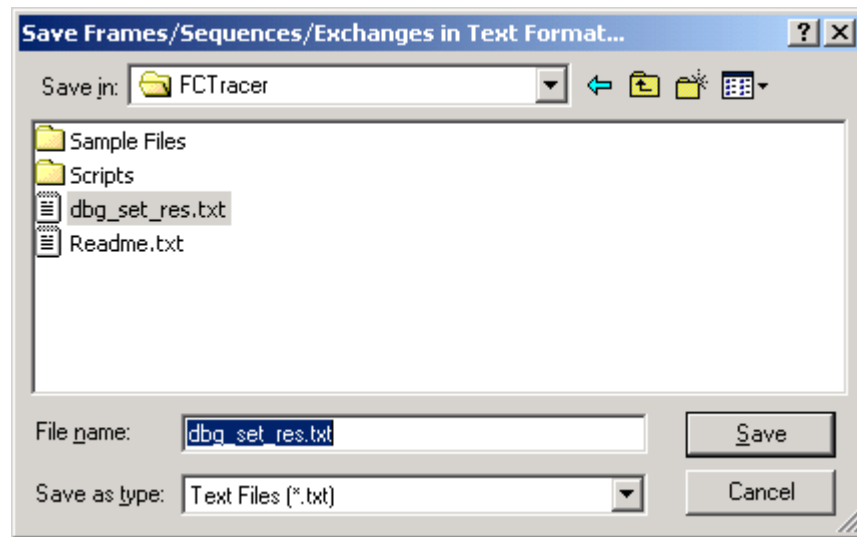
Step 1 From the **File** menu, select **Packets to Text...** under **Export**.

Step 2 In the **From** and **To** fields, enter the range.



Step 3 Click **OK**.

Step 4 Specify a path and filename, and click **Save**.



10. Reports

FCTracer and FCTracer 4G can generate graphs and statistical summaries of traffic - thereby providing an alternative view of traffic to the one shown in the trace window. Many of the utilities have hyperlinks which allow you to reposition the trace to an event that has been located in the report window.

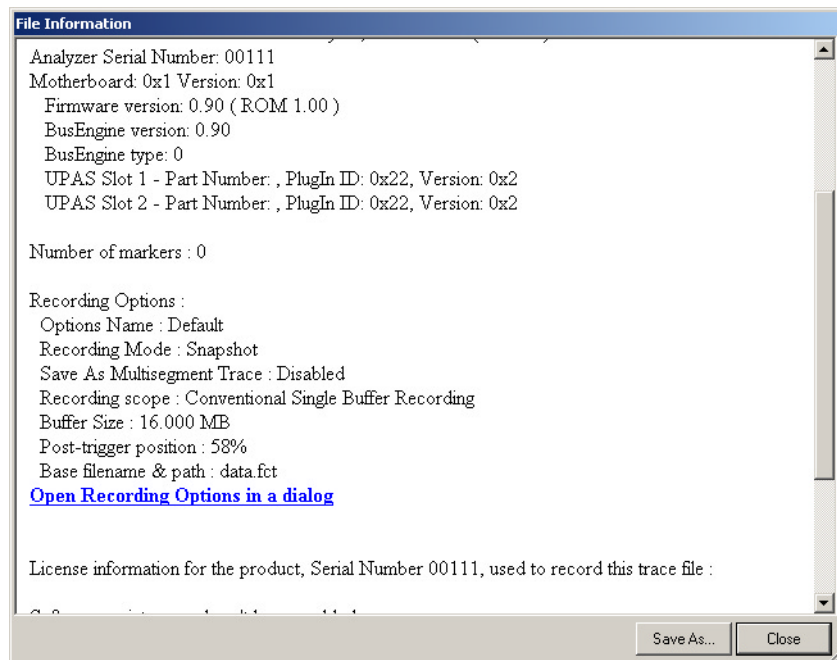
Reports include File Information, Error Summary, Bus Utilization, Timing and Bus Usage Calculations, Traffic Summary, Real-Time Statistics, Link Tracker and Frame Tracker.

10.1 File Information

The File Information report provides information about how the recording was made, what the buffer settings were, what the trigger options were, and what version of all the analyzer hardware was used to make the recording.

To display a File Information report,

- Select **Report > File Information** in the Menu Bar or click  in the Tool Bar.



Perhaps the most useful information in the dialog is the Recording Option settings used to create the trace. These settings are shown in the above screenshot. Also shown in the screenshot is a blue hypertext link to the Recording Option settings themselves. The link is marked with the text **Open Recording Options in a dialog**. Clicking this link causes the

software to open the Recording Options dialog and automatically populate the dialog with the settings used to create the open trace. This is a fast method of capturing the options used to create the trace. Once the options are in the Recording Options dialog, you can then use the **Save As** command to preserve them.

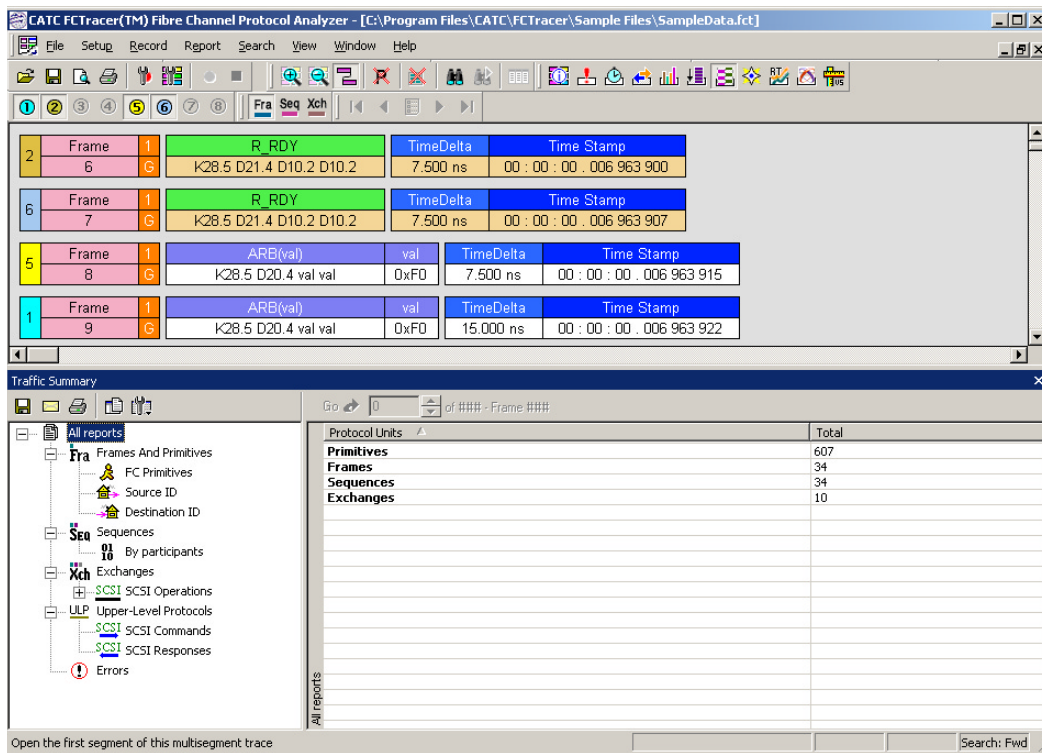
10.2 Traffic Summary

Traffic Summary displays a summary of the types of traffic that occurs in the current trace file and allows you to go to a specific frame, sequence, or exchange.

To display an Traffic Summary report,

- Click  in the Tool Bar or select **Report > File Information** from the Menu Bar

The Traffic Summary screen appears below the trace:



The screenshot shows the CATC FCTracer(TM) Fibre Channel Protocol Analyzer interface. The main window displays a list of frames with columns for Frame number, Type, Direction, Protocol, TimeDelta, and Time Stamp. Below this, the Traffic Summary window is open, showing a tree view of protocol levels on the left and a summary table on the right.

Traffic Summary Table:

Protocol Units	Total
Primitives	607
Frames	34
Sequences	34
Exchanges	10

The left pane displays a tree of the different protocol levels. The right pane displays a summary of the traffic for the selected level.

The left pane displays a tree of the different protocol levels. Click the plus symbol (+) to expand the tree. The example above is fully expanded. The right pane displays a summary of the traffic for the selected level.

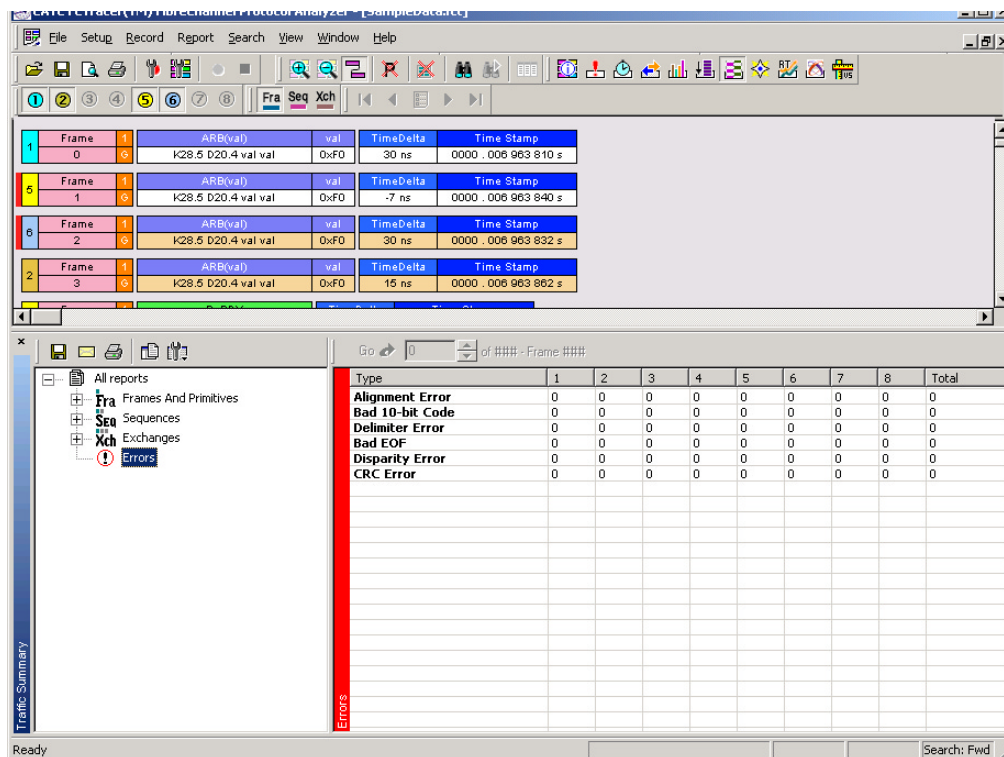
10.3 Error Summary

Clicking the Error Summary button  causes the Traffic Summary to open and display a summary of errors that occurred in the current trace. The errors are hyperlinked to the trace file - allowing you to go to a specific Frame, Sequence, or Exchange within the trace window.

To display an Error Summary report,

- Select **Error Summary** under **Report** in the Menu Bar or click  in the Tool Bar.

The Traffic Summary window appears. Errors are shown as a sub-set of the Traffic Summary:



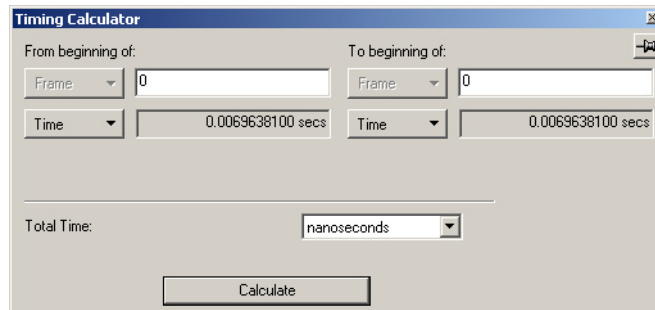
10.4 Timing Calculations

The Timing and Bus Usage Calculator calculates time between frames.

To calculate timing and bus usage,

Select **Report > Timing Calculations** from the Menu Bar or click  in the Tool Bar.

The Timing and Bus Usage Calculator dialog appears:



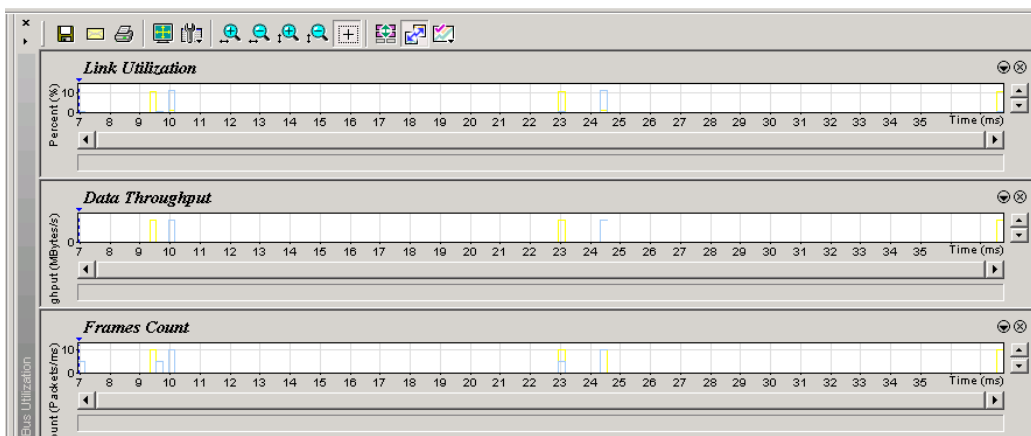
To calculate bus usage and bit rate errors on a range of Frames,

- Step 1** If calculating timing between Frames, enter the Frame numbers in the two Frame text boxes.
- Step 2** If calculating between markers, click the marker buttons under "From beginning of" and "To End of" and select markers from the lists.
- Step 3** If calculating timing between time points, click the Time buttons and enter time values.
- Step 4** Click the "Calculate" button. At this point, bus usage will be calculated.

10.5 Bus Utilization

The **Bus Utilization** window displays a graph of bandwidth use within a displayed trace.

To open the Bus Utilization window, select **Report > Bus Utilization** or click the button marked . A window will open with graphs of Link Utilization, Data Throughput, and Frame Counts:



Bus Utilization Buttons

The Bus Utilization window has a row of buttons for changing the format of the displayed data and for exporting data:



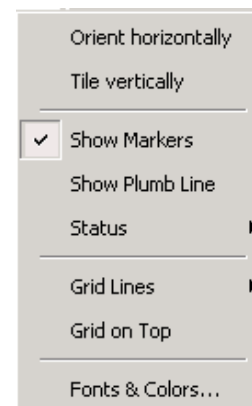
The buttons have the following functions:

	Save As - Saves the graphs as a bitmap file (*.bmp)		Vertical zoom in
	Email - Creates an email with a *.bmp file attachment of the graphs		Vertical zoom out
	Print		Click and Drag zoom - Click diagonally to select and zoom in on part of the graph
	Full Screen		Select Range
	View Settings - opens a sub-menu with options for formatting the display. See "View Settings Menu" below.		Sync and Graph areas - If two or more graphs are displayed, this button will synchronize the graphs to one another. Once synchronized, the positioning slider of one graph will move the other graphs
	Horizontal zoom in		Graph Areas - Presents options for displaying additional graphs of data lengths, frame, sequence, or exchange lengths, and percentage of bus utilized.
	Horizontal zoom out		

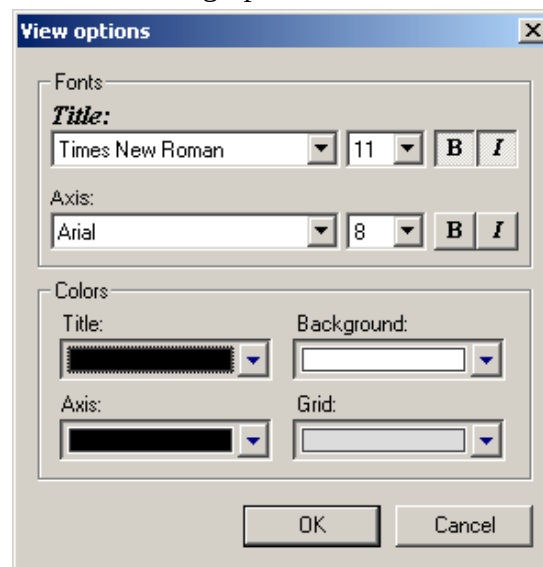
View Settings Menu

Clicking the View settings button  causes a menu to open with options for formatting the display.

- **Orient Horizontally** - changes the orientation of bus usage to horizontal. After selecting this option, the menu will say "Orient Vertically."
- **Tile Vertically** - tiles the two graphs vertically (i.e., side by side).
- **Show Markers** - Places "tick" marks along the x axis of each graph.



- **Show Plumb Line** - Displays a vertical line that connects your cursor to the horizontal axis. As the mouse is moved, the status bar will show the frame, sequence, or exchange and time frame to which the cursor is pointing.
- **Status** - Opens a sub-menu with the following options:
 - Bar - Displays a status bar at bottom of graph.
 - Tooltip - Causes a tooltip to appear if you position your mouse pointer over part of the graph and leave it there for a couple of seconds.
 - None - Turns off tooltips and the status bar.
- **Grid Lines** - Opens a sub-menu with the following options:
 - Both - Displays both X and Y axis gridlines.
 - X Axis - Displays X axis gridlines.
 - Y Axis - Display Y axis gridlines.
 - None - Turns off gridlines.
- **Grid on Top** - Moves the grid lines above the graph.
- **Fonts and Colors** - Opens a dialog box for setting the colors and fonts used in the graphs:



Graph Areas Menu

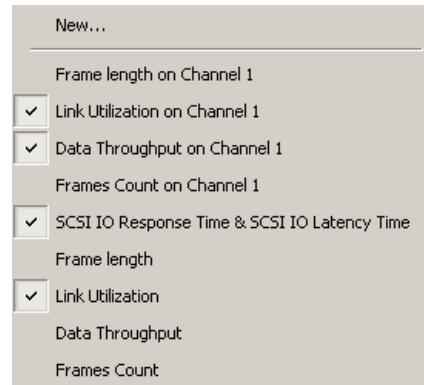
The Graph Areas menu allows you to view different information in the Bus Utilization window.

Step 1 Click the  button.

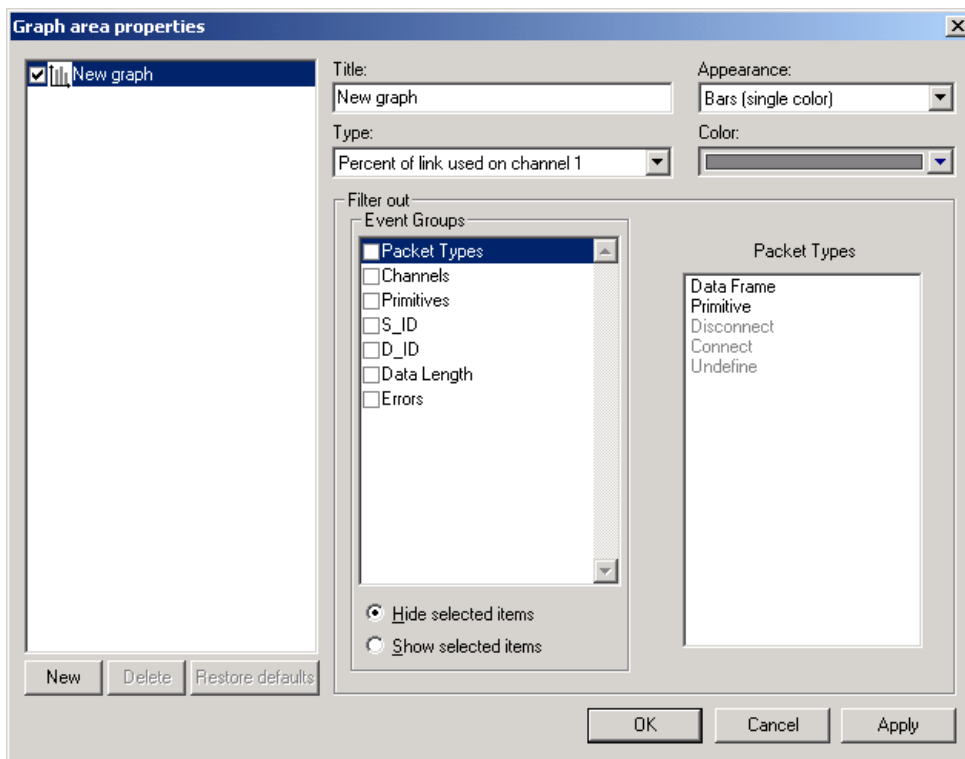
The Graph Areas menu opens.

Step 2 Select the data you want to appear in the Graph Areas window.

To change the properties in the Bus Utilizations graph, right-click and choose **Properties** from the pop-up menu. The Properties dialog box opens as shown below.



The following dialog box will open. It will display options for setting the title, appearance, color, and line type for the graph.



Excluding/Including Traffic from Graphs

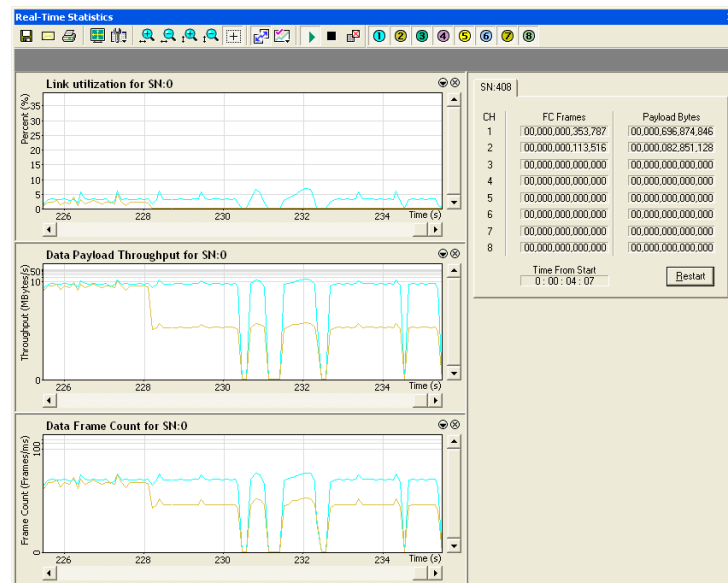
In addition to the various appearance settings, the Properties dialog box has options for hiding/showing traffic. To hide traffic from the graph, select events from the Event Groups and Packet Types lists and then select **Hide selected items**. To include traffic, select **Show selected items**.

10.6 Real Time Statistics

Real Time Statistics displays a summary of the traffic currently being recorded by the analyzer.

To display the Real-Time Statistics window, click  in the Tool Bar.

The Real Time Statistics window opens:



To see a graph of traffic, start Fibre Channel link activity, and then press  to start the Real-Time statistics monitor. As traffic flows on the link, data will stream in real-time to this window in a format of your choice.

To stop the monitor, press .

Real-Time Statistics Buttons

The Real-Time Statistics toolbar has buttons for changing the format of the displayed data and for exporting data:



The buttons have the following functions:

	Save As - Saves Real-Time graphs as bitmap files (*.bmp)		Vertical zoom in
	Email - Creates an email with a *.bmp file attachment of the graphs		Vertical zoom out
	Print		Click and Drag zoom - Click diagonally to select and zoom in on part of the graph
	Full Screen		Select Range
	View Settings - opens a sub-menu with options for formatting the display. See "View Settings Menu" below		Sync and Graph areas - If two or more graphs are displayed, this button will synchronize the graphs to one another. Once synchronized, the positioning slider of one graph will move the other graphs
	Horizontal zoom in		Graph Areas - Presents options for displaying additional graphs of data lengths, frame, sequence, or exchange lengths, and bus utilization
	Horizontal zoom out		Start. Starts the Real-Time Monitor
	Show channel. You can select Channel 1 through 8.		Stop Real-Time Monitoring
			Reset. Resets the graphs

Real-Time Statistical Monitor Pop-up Menu

If you right-click a graph in the Real-Time window, a pop-up menu appears with the following options:

Undo Zoom - If you have zoomed in, this command will undo the zoom.

Fit to Graph Area - Redisplays graph so that the entire trace fits inside graph area.

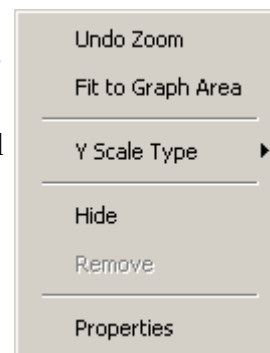
Y Scale Type:

Linear - Converts display to linear format.

Logarithmic - Converts display to logarithmic format.

Hide - Hides the selected graph.

Properties - Opens a dialog box with options for changing the colors, titles and other features of the graphs.



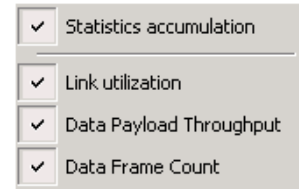
Displaying Multiple Graphs

The Real Time Statistics window can display up to three separate graphing windows. The window gives you different graphing options:

To view two or three graphs simultaneously, click the **Graph Areas** button. 

The menu has the following options:

- **Statistics Accumulation** - Allows you to display/hide the Min/Max/Avg Area on the right side of the Bus Utilization window.
- **Link Utilization %** - Plots the percentage of Link utilization by non-idle traffic for both directions of the link.
- **Data Frame, Sequence, Or Exchange Count (Packets/s)** - Plots counts of Fibre Channel Data Packets per second for both directions of the link.
- **Data Payload Throughput (MBytes)** - Plots data payload throughput for both directions of the link.

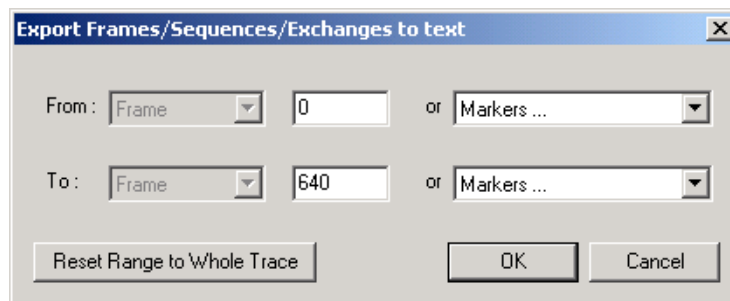


10.7 Exporting Frames and Data

FCTracer allows you to export Frames and data into text files.

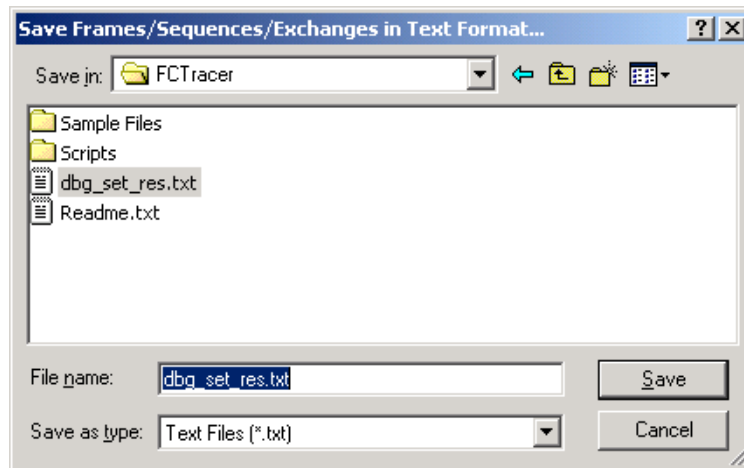
Step 1 From the **File** menu, select **Packets to Text...** under **Export**.

Step 2 In the **From** and **To** fields, enter the range.



Step 3 Click **OK**.

Step 4 Specify a path and filename, and click **Save**.



10.8 Link Tracker Window

The **Link Tracker** window displays a detailed chronological view of events. Events are shown in columns within the window, each column representing a channel. Time is presented as rows. Idle time is shown by empty rows in the window. Idles can be collapsed into gray strips running across the window.

Each time slot in the vertical axis represents the minimum time that a dword requires to traverse the bus. Time slot widths vary depending on bus speed and on how zoomed out the display is.

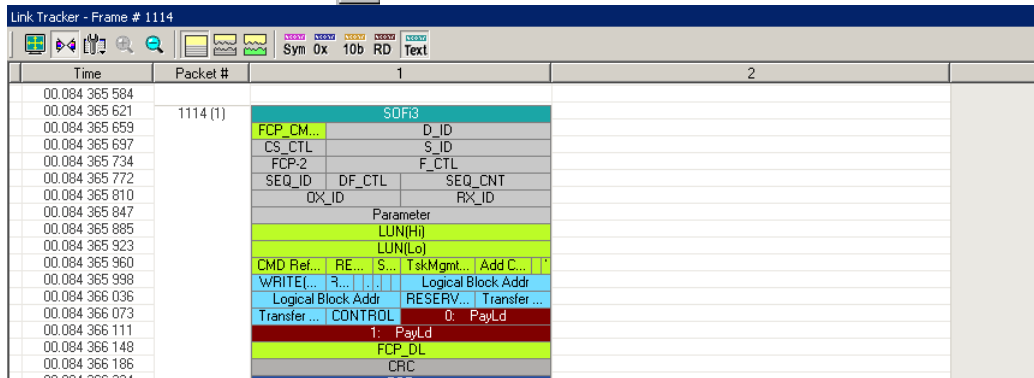
When the Link Tracker window is fully zoomed in, the time slots measure as follows:

- 1 G - 37.25 ns
- 2 G - 18.63 ns
- 4 G - 9.31 ns

When the window is fully zoomed out, the grid lines disappear and the scale changes to 1 dword = a line measuring 1 pixel in height .

Opening the Link Tracker Window

To open the Link Tracker window, select **Report > Link Tracker** or click the button marked . A window opens like the one shown below:



The screenshot shows the 'Link Tracker - Frame # 1114' window. It has a toolbar with icons for various functions and a menu bar with 'Sym', '0x', '10b', 'RD', and 'Text'. The main area is a table with columns for Time, Packet #, and two data columns labeled 1 and 2. The table displays a list of packets with their timestamps and details. Packet 1114 is expanded, showing a detailed view of its structure, including fields like FCP_CM..., D_ID, S_ID, F_CTL, SEQ_ID, DF_CTL, SEQ_CNT, OX_ID, RX_ID, Parameter, LUN(Hi), LUN(Lo), CMD Ref..., RE..., S..., TaskMgmt..., Add C..., WRITE..., Logical Block Addr, RESERV..., Transfer..., Transfer..., CONTROL, 0: PayLd, 1: PayLd, FCP_DL, and CRC.

Time	Packet #	1	2
00.084 365 584			
00.084 365 621			
00.084 365 659	1114 (1)	SOFS3	
00.084 365 697		FCP_CM...	D_ID
00.084 365 734		CS_CTL	S_ID
00.084 365 772		FCP-2	F_CTL
00.084 365 810		SEQ_ID	DF_CTL
00.084 365 847		SEQ_CNT	OX_ID
00.084 365 885		RX_ID	
00.084 365 923		Parameter	
00.084 365 960		LUN(Hi)	
00.084 365 998		LUN(Lo)	
00.084 366 036		CMD Ref...	RE...
00.084 366 073		S...	TaskMgmt...
00.084 366 111		Add C...	
00.084 366 148		WRITE...	Logical Block Addr
00.084 366 186		Logical Block Addr	RESERV...
		Transfer...	Transfer...
		CONTROL	0: PayLd
		1: PayLd	
		FCP_DL	
		CRC	

Window Layout

The Link Tracker window divides into two areas:

- **Toolbar** - Presents buttons for changing data format.
- **Main Display Area** - Displays traffic chronologically as it occurred in the recording. The window divides into columns: the first column shows time and traffic is shown on a channel by channel basis in the columns on the right.

Link Tracker Buttons

The Link Tracker window has a row of buttons for changing the format of the displayed data and for exporting data:



The buttons have the following functions:



Full Screen. Maximizes the Link Tracker window to fill the screen.



Collapse all Non-essential traffic. Collapses Idles and other non-essential traffic into grey strips running across the window.



Synchronize Trace View. Synchronizes the Trace View and Link Tracker windows so that a move in one window repositions the other. Because of the differences in scale and logic between the Link Tracker and Trace view windows, scrolling produces different effects depending on which window is being scrolled. Scrolling in the trace window causes the Link Tracker window to rapidly jump from event to event. Long periods of idle time are skipped. Scrolling in the Link Tracker window, in contrast, causes small moves in the trace window. Scrolling in the Link Tracker window causes the trace window to pause until the start of a packet is displayed. At that point, the trace window repositions itself. While scrolling through idle periods or the contents of a packet, the trace window will not move.



Show Symbolic Representation. (text and values).



View Options. Opens a menu with three options: Collapsible Idle Time, Tooltip Display, and Reset Column Widths. See **View Options Menu** below for descriptions.



Show Values



Zoom In



Show 10b Codes



Zoom Out



Show Symbols



Show Continuous Time Scale. Shows traffic in chronological order.



Show Text

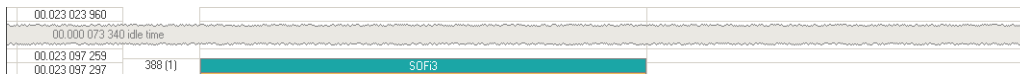


Collapse Idle Time. Shows traffic in chronological order but collapse Idles into grey strips across the window..

View Options Menu

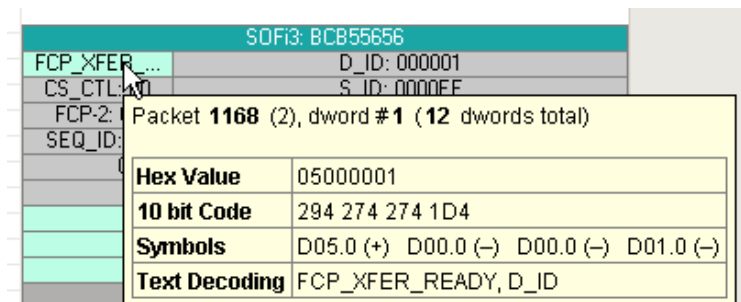
Clicking the View Options button  causes a menu to open with options for formatting the display.

- **Collapsible Idle Time** - Opens a dialog box for setting the Idle time value. By setting a value, you tell the analyzer when to collapse Idle times and display them as grayed out strips within the Link Tracker window. For example, if you had set the Idle time to value x then any time an Idle time exceeded x it would be displayed as a gray strip across the Link Tracker window.



- **Tooltip Display** - Opens a menu with options for adding content to tooltips. Tooltips will display when you position the mouse pointer over an item in the Link Tracker window. The options are:
 - Tooltip Display Values
 - Tooltip Displays 10 bit Codes
 - Tooltip Displays Symbols
 - Tooltips Displays Text Decoding

The following screenshot shows a tooltip in which all options have been enabled:



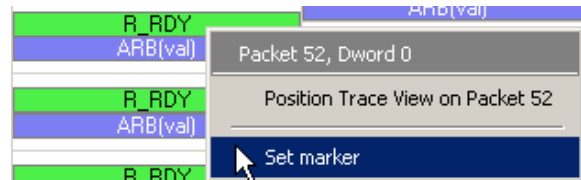
- **Reset Column Widths** - This option resets column widths to their defaults.

Docking and Undocking the Window

You can undock the Link Tracker window by double-clicking on the blue title bar along the left side of the window. Once undocked, the window can be dragged anywhere in the application. To redock, double-click again on the title bar.

Setting Markers

Markers can be set on any dword on any event within the Link Tracker window. To set a marker, right-click on an event, then select **Set Marker** from the pop-up menu. Once marked, events can be easily navigated to via the **Go to Marker** command in the **Search** menu.



Calculating Time between Dwords

You can calculate time between dwords by clicking on an event and then positioning your mouse pointer over a second event and reading the ensuing tooltip.

Step 1 Click on the time value for the first event.

00.009 481 034			R_RDY	ARB(val)	ARB(val)
00.009 481 172	52 (1)		ARB(val)		
00.009 481 189	55 (6)				
00.009 481 147	56 (1)		R_RDY		
00.009 481 185			ARB(val)		
00.009 481 222	61 (6)				

Step 2 Scroll down through the trace to the second event and position the mouse pointer above its time value. A tooltip will appear showing the time interval between the first and second events.

00.010 136 770					
00.010 136 808	262 (1)		OPNyx		
00.010 136 846	265 (6)		ARB(val)		
00.010 136 884					
00.010 136 921					
00.010 136 959	266 (1)		R_RDY		

Time from selected: 00.000 655 736

Hiding Idles and Other Traffic

You can hide Idles and other traffic in the Link Tracker window by clicking the Hide Idles button on the Link Tracker toolbar  or any of the Hide buttons in the Trace window - for example, Hide Channels  or by selecting one or more of the various Hide options in the Display Options dialog box.

Searching

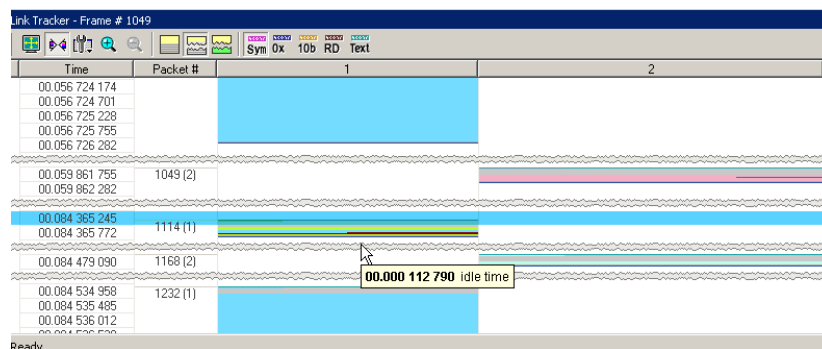
When the Trace view and Link Tracker windows are synchronized, the **Find** and **Go To** options in the **Search** menu will apply to the Link Tracker window. The Trace and Link Tracker windows can be synchronized by selecting the Synchronize button .

Zooming In and Out

Zooming out can give you a quick, high-level view of a trace. A fully zoomed out trace will only show columns and colored lines. Using the colors you can see what types of traffic running through the trace - for example, brown represents data, and dark green is a Start of Frame.

Further information can be obtained on any point of interest in the trace by positioning your mouse pointer over it. Tool tips provide detailed description of events.

Note that when fully zoomed out, the smallest graphical unit is the dword, represented by a single line. Zooming out makes the trace appear smaller and increases the time scale in the first column.



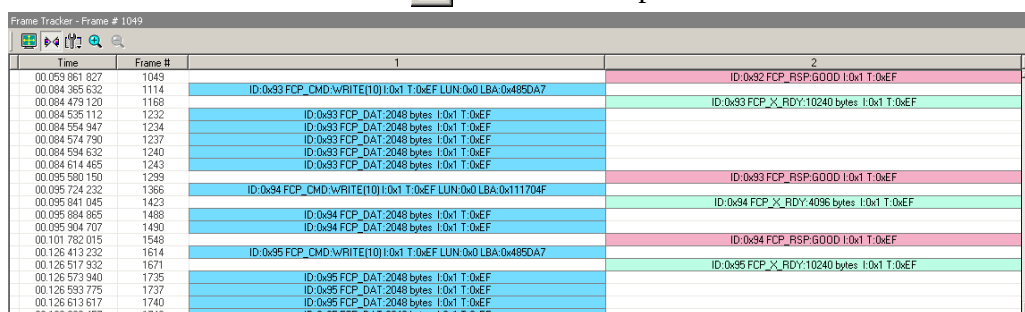
10.9 Frame Tracker Window

The **Frame Tracker** window displays a detailed chronological view of traffic on a Frame-by-Frame basis. Events are shown within columns within the window, each column representing a channel. Time is presented as rows. Idle time is shown by empty rows in the window.

Each time slot in the vertical axis represents the minimum time required by a Frame to traverse the bus.

Opening the Frame Tracker Window

To open the Frame Tracker window, select **Report > Frame Tracker** or click the button marked . A window opens like the one shown below:



Window Layout

The Frame Tracker window divides into two areas:

- **Toolbar** - Presents buttons for changing data format.
- **Main Display Area** - Displays traffic chronologically as it occurred in the recording. The window divides into columns: the first column shows time and traffic is shown on a channel by channel basis in the columns on the right.

Frame Tracker Buttons

The Frame Tracker window has a row of buttons for changing the format of the displayed data and for exporting data:



The buttons have the following functions:



Full Screen



Zoom In



Synchronize Trace View.
Synchronizes the Trace View and Frame Tracker windows so that a move in one window repositions the other.



Zoom Out



View Options. Opens a menu with three options: Collapsible Idle Time, Tooltip Display, and Reset Column Widths. See **View Options Menu** below for descriptions.

View Options Menu

Clicking the View Options button  causes a menu to open with options for formatting the display.

- **Time Format**- Opens a menu with options for setting the time format. There are two options:
 - Seconds
 - Clocks
- **Reset Column Widths** - This option resets column widths to their defaults.

Normally, columns will automatically resize themselves if the application window is made larger or smaller. However, if you manually resize any columns in the Frame Tracker window, column widths become static. Thereafter, if you resize the application

window, the Frame Tracker columns will not adjust automatically. **Reset Column Widths** re-enables this automatic resizing capability.

Docking and Undocking the Window

You can undock the Frame Tracker window by double-clicking on the blue title bar along the left side of the window. Once undocked, the window can be dragged anywhere in the application. To redock, double-click again on the title bar.

Calculating Time between Frames

You can calculate time between Frames by clicking on an event and then positioning your mouse pointer over a second event and reading the ensuing tooltip.

Step 1 Click on the time value for the first event.

Time	Frame #	1
00.036 512 472	360	ID:0x90 FCP_CMD:WRITE(10) I:0x1 T:0xEF LUN:0x0 LBA:0x485DA7
00.036 633 700	416	
00.036 690 195	481	ID:0x90 FCP_DAT:2048 bytes I:0x1 T:0xEF
00.036 710 037		P_DAT:2048 bytes I:0x1 T:0xEF
00.036 729 872		P_DAT:2048 bytes I:0x1 T:0xEF

Step 2 Scroll down through the trace to the second event and position the mouse pointer above its time value. A tooltip will appear showing the time interval between the first and second events.

Time	Frame #	1
00.036 512 472	360	ID:0x90 FCP_CMD:WRITE(10) I:0x1 T:0xEF LUN:0x0 LBA
00.036 633 700	416	
00.036 690 195	481	ID:0x90 FCP_DAT:2048 bytes I:0x1 T:0xEF
00.036 710 037	484	ID:0x90 FCP_DAT:2048 bytes I:0x1 T:0xEF
00.036 729 872	487	ID:0x90 FCP_DAT:2048 bytes I:0x1 T:0xEF
00.036 749 715	490	ID:0x90 FCP_DAT:2048 bytes I:0x1 T:0xEF
00.036 769 550	493	ID:0x90 FCP_DAT:2048 bytes I:0x1 T:0xEF
00.047 580 07		Time from selected Frame #416: 00.000 116 015
00.047 735 925	617	ID:0x90 FCP_CMD:WRITE(10) I:0x1 T:0xEF LUN:0x0 LBA

Hiding Traffic

You can hide Primitives, Channels and other data from the Frame Tracker window by clicking the Hide buttons on the toolbar in the Trace window or by selecting one or more of the Hide options in the Display Options dialog box.

Searching

When the Trace view and Frame Tracker windows are synchronized, the Find and Go To options in the Search menu will apply to the Frame Tracker window. The Trace and Frame Tracker windows can be synchronized by selecting the Synchronize button .

Zooming In and Out

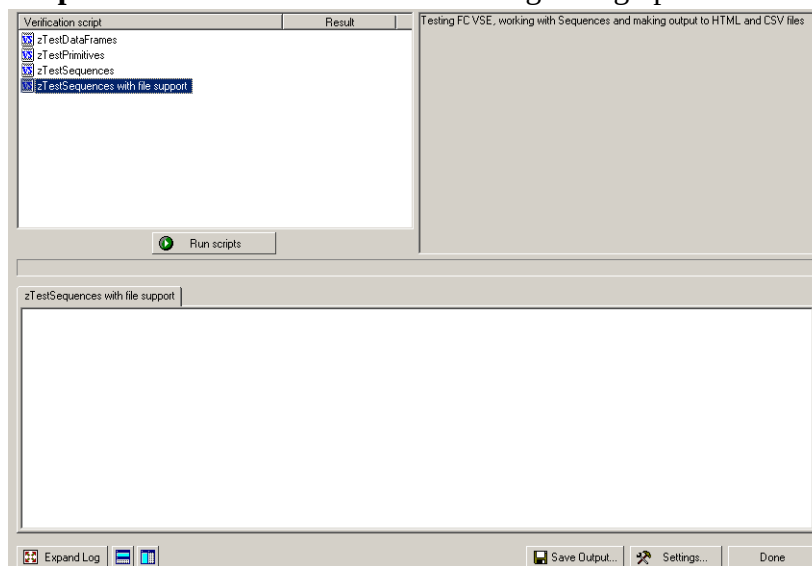
Zooming out can give you a quick, high-level view of a trace.

11. Verification Scripts

FCTracer and FCTracer 4G have a utility called the *Verification Script Engine* (VSE) which allows users to run performance/validation tests on traces. The VSE is described in detail in the *Verification Script Engine for CATC FCTracer Reference Manual*.

To execute the VSE, you open a trace, then open the Verification Script window, and finally select and execute a test script. The script runs and prints out the results in the log window.

To open the Verification Script window, select **Reports > Run verification scripts ...** from the menu. The following dialog opens:



11.1 Window Layout

The Script Verification window divides into four areas: a Script List in the top left, a Script Description in the gray area at the top right, an Output window at the bottom, and a toolbar along the bottom border of the window.

Script Menu area

The Script Menu area contains a list of verification scripts that can be run. To run a script, select it, then click **Run Script** button.

Script Menu Pop-Up Menu

Right-clicking in the Script Menu area will open a pop-up menu with options to create, edit, and run a script.

Run verification script(s) - Executes selected scripts.

Edit Script - Opens the selected script in Notepad.

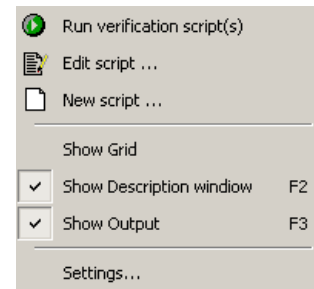
New Script - Opens Notepad and displays whatever Script template you are using.

Show Grid - Displays gridlines in the Script Menu area.

Show Description window - Shows/Hides the Description window in the top right side of the Script Verification window.

Show Output - Shows/Hides the log window.

Settings - Opens the Settings dialog.



The Settings Dialog

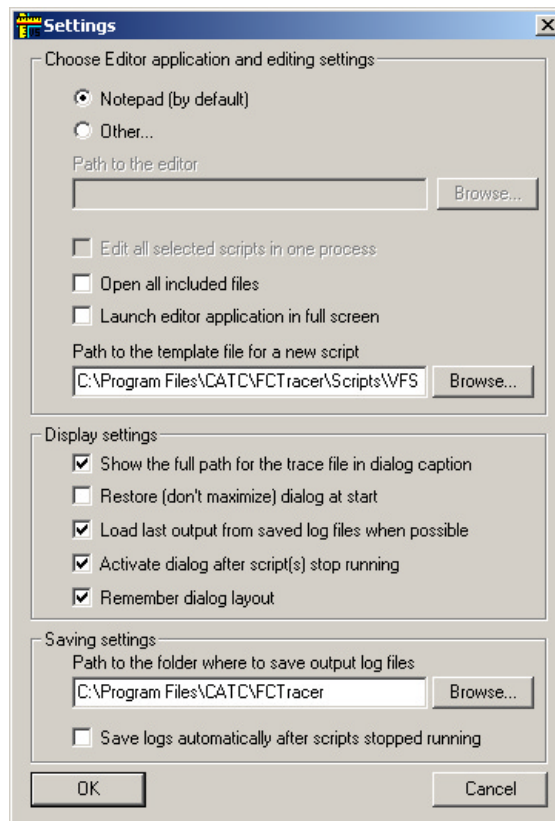
The Settings dialog controls the defaults for the Script Verification window.

Choose Editor Application and editing settings - Gives the option to change the default editor from Notepad to an editor of your choice.

Edit all selected scripts in one process - Automatically opens all selected scripts with the selected Editor.

Path to the template file for a new script - Sets the location of the template that is the basis for new scripts.

Show the full path for the trace file in dialog caption - Displays the path of the open trace in the window title bar.



Restore (don't minimize) dialog at start - Displays Verification Script window in non-minimized size when window is first opened.

Load last output from saved log files when possible - Loads the output from the saved log files into the output window.

Activate dialog after script(s) stop running - Brings **Run VS** dialog to the foreground when the scripts stop running.

Remember dialog layout - Preserves layout of window after window is closed.

Path to the folder where to save the output log files - Default is the application folder.

Saves logs automatically after scripts stop running - Automatically saves the script logs into the application folder or other location when the script stops running.

Script Description Area

Describes the selected script. Descriptions for scripts are defined in set DecoderDesc= "MyDescription."

Output window

Displays the output of the script as it executes.

11.2 Additional Resources

For Further Information - See the *Verification Script Engine Reference Manual*.

10. How to Contact CATC

Type of Service	Contact
Call for technical support...	US and Canada: 1 (800) 909-2282 Worldwide: 1 (408) 727-6600
Fax your questions...	Worldwide: 1 (408) 727-6622
Write a letter...	Computer Access Technology Corp. Customer Support 3385 Scott Blvd. Santa Clara, CA 95054 USA
Send e-mail...	support@CATC.com
Visit CATC's web site...	http://www.CATC.com/

Limited Hardware Warranty

So long as you or your authorized representative ("you" or "your"), fully complete and return the registration card provided with the applicable hardware product or peripheral hardware products (each a "Product") within fifteen days of the date of receipt from Computer Access Technology Corporation ("CATC") or one of its authorized representatives, CATC warrants that the Product will be free from defects in materials and workmanship for a period of three years (the "Warranty Period"). You may also complete your registration form via the internet by visiting <http://www.catc.com/support/register/>. The Warranty Period commences on the earlier of the date of delivery by CATC of a Product to a common carrier for shipment to you or to CATC's authorized representative from whom you purchase the Product.

What this Warranty Does Not Cover

This warranty does not cover damage due to external causes including accident, damage during shipment after delivery to a common carrier by CATC, abuse, misuse, problems with electrical power, including power surges and outages, servicing not authorized by CATC, usage or operation not in accordance with Product instructions, failure to perform required preventive maintenance, software related problems (whether or not provided by CATC), problems caused by use of accessories, parts or components not supplied by CATC, Products that have been modified or altered by someone other than CATC, Products with missing or altered service tags or serial numbers, and Products for which CATC has not received payment in full.

Coverage During Warranty Period

During the Warranty Period, CATC or its authorized representatives will repair or replace Products, at CATC's sole discretion, covered under this limited warranty that are returned directly to CATC's facility or through CATC's authorized representatives.

How to Obtain Warranty Service

To request warranty service, you must complete and return the registration card or register via the internet within the fifteen day period described above and report your covered warranty claim by contacting CATC Technical Support or its authorized representative. CATC Technical Support can be reached at 800-909-7112 or via email at support@catc.com. You may also refer to CATC's website at <http://www.catc.com> for more information on how to contact an authorized representative in your region. If warranty service is required, CATC or its authorized representative will issue a Return Material Authorization Number. You must ship the Product back to CATC or its authorized representative, in its original or equivalent packaging, prepay shipping charges, and insure the shipment or accept the risk of loss or damage during shipment. CATC must receive the Product prior to expiration of the Warranty Period for the repair(s) to be covered. CATC or its authorized representative will thereafter ship the repaired or replacement Product to you freight prepaid by CATC if you are located in the continental United States. Shipments made outside the continental United States will be sent freight collect.

Please remove any peripheral accessories or parts before you ship the Product. CATC does not accept liability for lost or damaged peripheral accessories, data or software.

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If CATC evaluates and determines there is "no trouble found" in any Product returned or that the returned Product is not eligible for warranty coverage, CATC will inform you of its determination. If you thereafter request CATC to repair the Product, such labor and service shall be performed under the terms and conditions of CATC's then current repair policy. If you chose not to have the Product repaired by CATC, you agree to pay CATC for the cost to return the Product to you and that CATC may require payment in advance of shipment.

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